WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

Insight Report

The Future of Jobs Report

2018

- *Changing employment types:* Nearly 50% of companies expect that automation will lead to some reduction in their full-time workforce by 2022, based on the job profiles of their employee base today. However, 38% of businesses surveyed expect to extend their workforce to new productivity-enhancing roles, and more than a quarter expect automation to lead to the creation of new roles in their enterprise. In addition, businesses are set to expand their use of contractors doing task-specialized work, with many respondents highlighting their intention to engage workers in a more flexible manner, utilizing remote staffing beyond physical offices and decentralization of operations.

- *A new human-machine frontier within existing tasks:* Companies expect a significant shift on the frontier between humans and machines when it comes to existing work tasks between 2018 and 2022. In 2018, an average of 71% of total task hours across the 12 industries covered in the report are performed by humans, compared to 29% by machines. By 2022 this average is expected to have shifted to 58% task hours performed by humans and 42% by machines. In 2018, in terms of total working hours, no work task was yet estimated to be predominantly performed by a machine or an algorithm. By 2022, this picture is projected to have somewhat changed, with machines and algorithms on average increasing their contribution to specific tasks by 57%. For example, by 2022, 62% of organization's information and data processing and information search and transmission tasks will be performed by machines compared to 46% today. Even those work tasks that have thus far remained overwhelmingly human—communicating and interacting (23%); coordinating, developing, managing and advising (20%); as well as reasoning and decision-making (18%)—will begin to be automated (30%, 29%, and 27% respectively). Relative to their starting point today, the expansion of machines' share of work task performance is particularly marked in the reasoning and decision-making, administering, and looking for and receiving job-related information tasks.

- *A net positive outlook for jobs:* However this finding is tempered by optimistic estimates around emerging tasks and growing jobs which are expected to offset declining jobs. Across all industries, by 2022, growth in emerging professions is set to increase their share of employment from 16% to 27% (11% growth) of the total employee base of company respondents, whereas the employment share of declining roles is set to decrease from currently 31% to 21% (10% decline). About half of today's core jobs—making up the bulk of employment across industries—will remain stable in the period up to 2022. Within the set of companies surveyed, representing over 15 million workers in total, current estimates would suggest a decline of 0.98 million jobs and a gain of 1.74 million jobs. Extrapolating these trends across those employed by large firms in the global (non-agricultural) workforce, we generate a range of estimates for job churn in the period up to 2022. One set of estimates indicates that 75 million jobs may be displaced by a shift in the division of labour between humans and machines, while 133 million new roles may emerge that are more adapted to the new division of labour between humans, machines and algorithms. While these estimates and the assumptions behind them should be treated with caution, not least because they represent a subset of employment globally, they are useful in highlighting the types of adaptation strategies that must be put in place to facilitate the transition of the workforce to the new world of work. They represent two parallel and interconnected fronts of change in workforce transformations: 1) large-scale decline in some roles as tasks within these roles become automated or redundant, and 2) large-scale growth in new products and services—and associated new tasks and jobs—generated by the adoption of new technologies and other socio-economic developments such as the rise of middle classes in emerging economies and demographic shifts.

- *Emerging in-demand roles:* Among the range of established roles that are set to experience increasing demand in the period up to 2022 are Data Analysts and Scientists, Software and Applications Developers, and Ecommerce and Social Media Specialists, roles that are significantly based on and enhanced by the use of technology. Also expected to grow are roles that leverage distinctively 'human' skills, such as Customer Service Workers, Sales and Marketing Professionals, Training and Development, People and Culture, and Organizational Development Specialists as well as Innovation Managers. Moreover, our analysis finds extensive evidence of accelerating demand for a variety of wholly new specialist roles related to understanding and leveraging the latest emerging technologies: AI and Machine Learning Specialists, Big Data Specialists, Process Automation Experts, Information Security Analysts, User Experience and Human-Machine Interaction Designers, Robotics Engineers, and Blockchain Specialists.

- *Growing skills instability:* Given the wave of new technologies and trends disrupting business models and the changing division of labour between workers and machines transforming current job profiles, the vast majority of employers surveyed for this report expect that, by 2022, the skills required to perform most jobs will have shifted significantly. Global average *skills stability*—the proportion of core skills required to

perform a job that will remain the same—is expected to be about 58%, meaning an average shift of 42% in required workforce skills over the 2018–2022 period.

- *A reskilling imperative:* By 2022, no less than 54% of all employees will require significant re- and upskilling. Of these, about 35% are expected to require additional training of up to six months, 9% will require reskilling lasting six to 12 months, while 10% will require additional skills training of more than a year. Skills continuing to grow in prominence by 2022 include analytical thinking and innovation as well as active learning and learning strategies. Sharply increasing importance of skills such as technology design and programming highlights the growing demand for various forms of technology competency identified by employers surveyed for this report. Proficiency in new technologies is only one part of the 2022 skills equation, however, as 'human' skills such as creativity, originality and initiative, critical thinking, persuasion and negotiation will likewise retain or increase their value, as will attention to detail, resilience, flexibility and complex problem-solving. Emotional intelligence, leadership and social influence as well as service orientation also see an outsized increase in demand relative to their current prominence.
- *Current strategies for addressing skills gaps*: Companies highlight three future strategies to manage the skills gaps widened by the adoption of new technologies. They expect to hire wholly new permanent staff already possessing skills relevant to new technologies; seek to automate the work tasks concerned completely; and retrain existing employees. The likelihood of hiring new permanent staff with relevant skills is nearly twice the likelihood of strategic redundancies of staff lagging behind in new skills adoption. However, nearly a quarter of companies are undecided or unlikely to pursue the retraining of existing employees, and two-thirds expect workers to adapt and pick up skills in the course of their changing jobs. Between one-half and two-thirds are likely to turn to external contractors, temporary staff and freelancers to address their skills gaps.
- *Insufficient reskilling and upskilling:* Employers indicate that they are set to prioritize and focus their re- and upskilling efforts on employees currently performing high-value roles as a way of strengthening their enterprise's strategic capacity, with 54% and 53% of companies, respectively, stating they intend to target employees in key roles and in frontline roles which will be using relevant new technologies. In addition, 41% of employers are set to focus their reskilling provision on high-performing employees while a much smaller proportion of 33% stated that they would prioritize at-risk employees in roles expected to be most affected by technological disruption. In other words, those most in need of reskilling and upskilling are least likely to receive such training.

There are complex feedback loops between new technology, jobs and skills. New technologies can drive business growth, job creation and demand for specialist skills but they can also displace entire roles when certain tasks become obsolete or automated. Skills gaps—both among workers and among the leadership of organizations—can speed up the trends towards automation in some cases but can also pose barriers to the adoption of new technologies and therefore impede business growth.

The findings of this report suggest the need for a comprehensive 'augmentation strategy', an approach where businesses look to utilize the automation of some job tasks to complement and enhance their human workforces' comparative strengths and ultimately to enable and empower employees to extend to their full potential. Rather than narrowly focusing on automation-based labour cost savings, an augmentation strategy takes into account the broader horizon of value-creating activities that can be accomplished by human workers, often in complement to technology, when they are freed of the need to perform routinized, repetitive tasks and better able to use their distinctively human talents.

However, to unlock this positive vision, workers will need to have the appropriate skills enabling them to thrive in the workplace of the future and the ability to continue to retrain throughout their lives. Crafting a sound in-company lifelong learning system, investing in human capital and collaborating with other stakeholders on workforce strategy should thus be key business imperatives, critical to companies' medium to long-term growth, as well as an important contribution to society and social stability. A mindset of agile learning will also be needed on the part of workers as they shift from the routines and limits of today's jobs to new, previously unimagined futures. Finally, policy-makers, regulators and educators will need to play a fundamental role in helping those who are displaced repurpose their skills or retrain to acquire new skills and to invest heavily in the development of new agile learners in future workforces by tackling improvements to education and training systems, as well as updating labour policy to match the realities of the Fourth Industrial Revolution.

Part 1

Preparing the Future Workforce

The Future of Jobs Report 2018

Introduction

A significant volume of research on the theme of the future of work has emerged since the World Economic Forum published its initial report on the subject—*The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*[1]—at the Forum's Annual Meeting in January 2016. What the future of work might hold is a concern that resonates broadly and that has fuelled extensive discussion among policy-makers, business leaders and individual workers.[2] Over the past few years, academics, think tanks, strategy consultants and policy-makers have debated what the future of work might look like, how it can be productively shaped for the benefit of economies and societies, and the implications of changes to work for individuals, for their livelihoods, and for the youngest generations studying to enter the future workforce.[3]

Common to these recent debates is an awareness that, as technological breakthroughs rapidly shift the frontier between the work tasks performed by humans and those performed by machines and algorithms, global labour markets are likely to undergo major transformations. These transformations, if managed wisely, could lead to a new age of good work, good jobs and improved quality of life for all, but if managed poorly, pose the risk of widening skills gaps, greater inequality and broader polarization. In many ways, the time to shape the future of work is *now*.

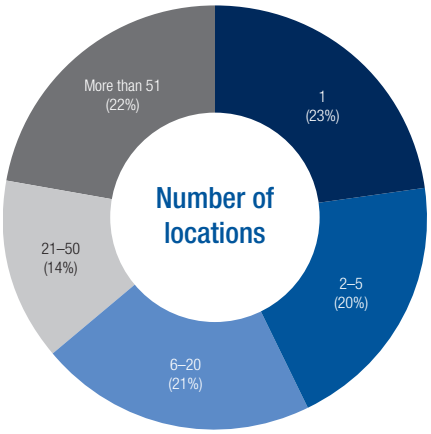
To support responses to the critical questions confronting businesses, governments and workers over the coming years, and to reassess its 2016 findings, the World Economic Forum has conducted a second iteration of the Future of Jobs Survey. While much valuable analysis has been authored over the past two years by a broad range of analysts and researchers, the debate has often focused on the far-term horizon, looking to the future of work in 2030, 2040 or 2050. Those approaches can be complemented by an operational time horizon—with the potential to hold up a mirror to current practises, to provide an opportunity for leaders to re-asses their current direction and its likely outcomes, and to consider potential adjustments. As forecasts of the extent of structural change across global labour markets depend on taking into consideration the time horizon, this report—and future editions—aim to provide a (rolling) five-year outlook. This edition covers the 2018–2022 period.

A particular focus of this new edition of the report is to arrive at a better understanding of the potential of new technologies to create as well as disrupt jobs and to improve the quality and productivity of the existing work of human employees. Our findings indicate that, by 2022, *augmentation* of existing jobs through technology may free up workers from the majority of data processing and information search tasks—and may also increasingly support them in high-value tasks such as reasoning and decision-making as augmentation becomes increasingly common over the coming years as a way to supplement and complement human labour. The changes heralded by the use of new technologies hold the potential to expand labour productivity across industries, and to shift the axis of competition between companies from a focus on automation-based labour cost reduction to an ability to leverage technologies as tools to complement and enhance human labour.

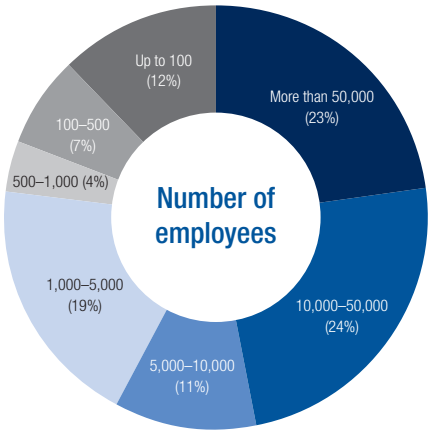
The data in this report represents the current understanding of human resources leaders—primarily of large employers with operations in multiple geographic locations—of the factors informing their planning, hiring, training and investment decisions at present and through to the report's 2022 time horizon. The findings described

Figure 1: Sample overview by number of locations and number of employees, 2018

1a: Number of locations



1b: Number of employees



Source: Future of Jobs Survey 2018, World Economic Forum.

throughout the report are not foregone conclusions but trends emerging from the collective actions and investment decisions taken or envisaged by companies today. The usefulness of this focused perspective lies precisely in its operational concreteness, shedding light on the understanding and intentions of companies that are often setting the pace of global labour market change within their sectors and geographies as well as shaping demand for talent across global value chains and fast-growing online talent platforms.

Since the publication of the 2016 edition of the report, business leaders' view of the human resources function has begun to shift decisively—continuing a broader rethinking that has been going on for some time. Talent management and workforce analytics are increasingly integral elements of companies' future-readiness plans. Yet relatively few organizations have so far formulated comprehensive workforce strategies for the Fourth Industrial Revolution. Therefore, this report also aims to serve as a call to action. Rapid adaptation to the new labour market is possible, provided there is concerted effort by all stakeholders. By evaluating the issues at hand from the perspective of some of the world's largest employers, we hope to improve current knowledge around anticipated skills requirements, recruitment patterns and training needs. Furthermore, it is our hope that this knowledge can incentivize and enhance partnerships between governments, educators, training providers, workers and employers in order to better manage the transformative workforce impact of the Fourth Industrial Revolution.

Survey and research design

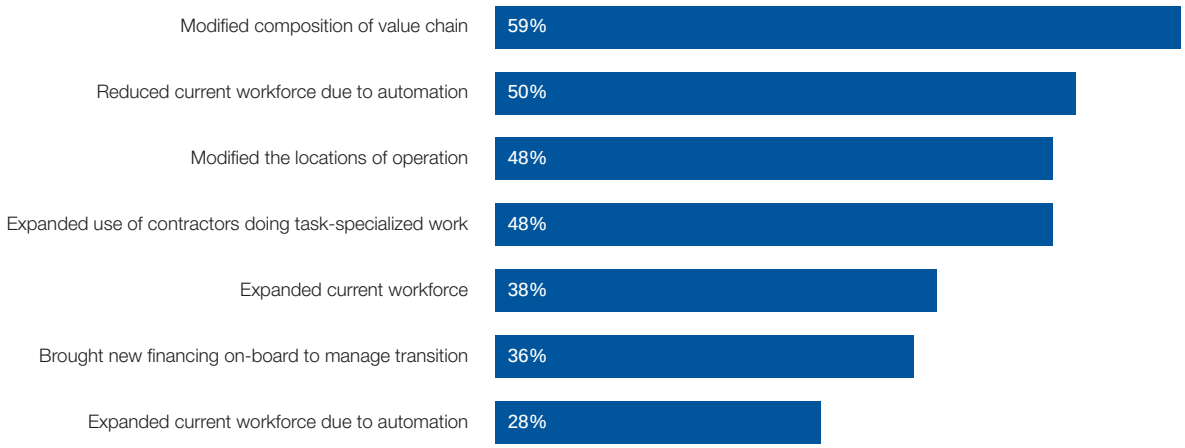
The Future of Jobs Report 2018, and the corresponding survey and research framework, represent an evolution of the approach taken in the report's 2016 edition. The original research framework was developed in collaboration with leading experts from the World Economic Forum's Global Future Councils, including representatives from academia, international organizations, professional service firms and the heads of human resources of major organizations. The 2018 edition reflects lessons learned from the design and execution of the original survey. The employer survey at the heart of this report was conducted in the first half of 2018 through the World Economic Forum's global membership community—covering a comprehensive range of industries and geographies (for details, see **Appendix B: Industry and Regional Classifications**)—and in close collaboration with a number of leading research institutes and industry associations worldwide.

The survey focused on gathering the views of business executives—principally Chief Human Resources Officers (CHROs) facing the workforce changes afoot in today's enterprises. The questions asked can be briefly outlined in three parts: (1) questions aimed at mapping the transformations currently underway; (2) questions focused on documenting shifting work tasks and therefore skills requirements in the job roles performed by individuals in the workplace of 2022; and (3) questions aimed at understanding the priorities and objectives companies have set themselves in terms of workforce training and reskilling and upskilling (**Appendix A: Report Methodology** provides a detailed overview of the report's survey design and research methodology).

The resulting data set represents the operational understanding of strategic human resources professionals, specifically those of large employers operating in multiple locations (Figures 1a and 1b). While only a minority of the world's global workforce of more than three billion people is directly employed by large multinational employers, these companies often act as anchors for local firm ecosystems. Therefore, in addition to their own significant share of employment, workforce-planning decisions by these firms have the potential to transform local labour markets through indirect employment effects and spillovers, and by setting the pace for adoption of new technologies and changing skills and occupational requirements.

In total, the report's data set contains 313 unique responses by global companies from a wide range of industry sectors, collectively representing more than 15 million employees (Table 1). In addition, the report's regional analysis is based on a diversified sample with a focus on balanced representation of company-level responses for 20 developed and emerging economies—Argentina, Australia, Brazil, China, France, Germany, India, Indonesia, Japan, Mexico, Philippines, Russian Federation, Singapore, South Africa, Korea, Rep., Switzerland, Thailand, United Kingdom,

Figure 4: Projected (2022) effects on the workforce of current growth strategy, by proportion of companies



Source: Future of Jobs Survey 2018, World Economic Forum.

These two crucial dimensions are examined further in the following two sub-sections.

From automation to augmentation

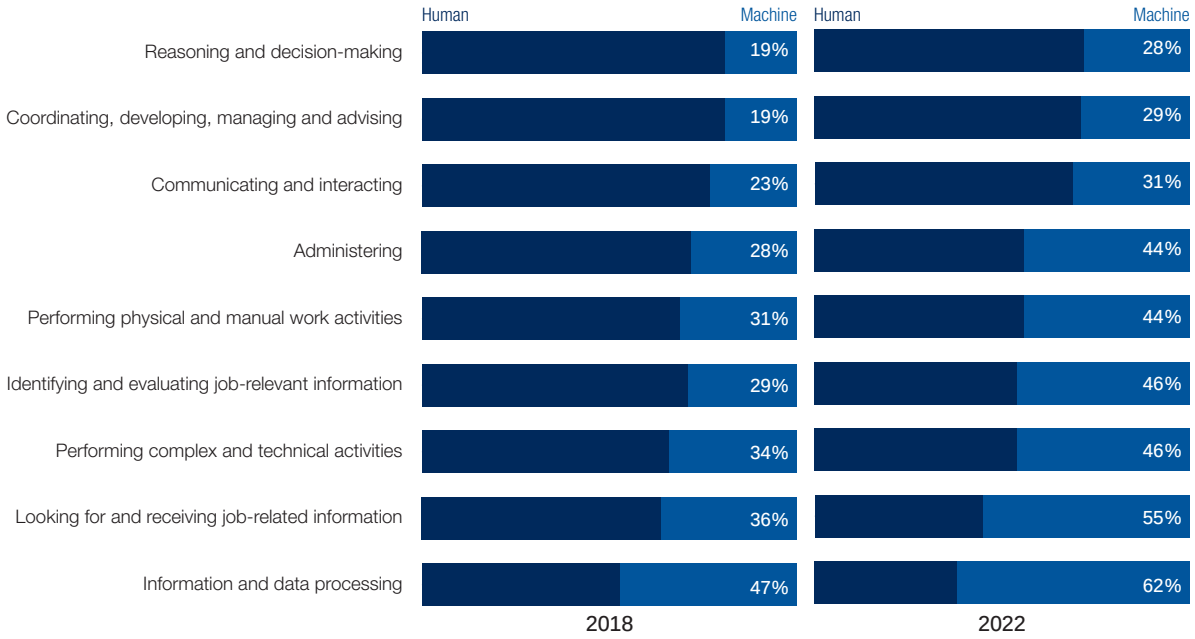
Some forecasts project that advances in automation will result in the wholesale replacement of the human workforce. Encompassing the near- or medium-term timeframes, our analysis suggests another perspective: that work currently performed by humans is being augmented by machine and algorithmic labour. Responses from employers surveyed for this report can be interpreted as evidence for the increasing viability of what a number of experts have called an 'augmentation strategy'. Namely, it has been suggested that businesses can look to utilize the automation of some job tasks to complement and enhance the human workforces' comparative strengths and ultimately to enable and empower employees to extend to their full potential and competitive advantage.[13] Rather than narrowly focusing on automation-based labour cost savings, an augmentation strategy takes into account the broader horizon of value creating activities that can be accomplished by human workers, often in complement to technology, when they are freed of the need to perform routinized, repetitive tasks and better able to use their distinctively human talents.[14]

Importantly, most automation occurs at the level of specific work tasks, not at the level of whole jobs.[15] For example, according to one recent study, whereas nearly two-thirds of today's job roles entail at least 30% of tasks that could be automated based on currently available technology, only about one-quarter of today's job roles can be said to have more than 70% of tasks that are automatable.[16] A similar recent analysis finds that workforce automation is likely to play out in three waves between today and the mid-2030s, increasing the share of fully automatable manual tasks in the most affected current job roles from less than 5% today to nearly 40% by the mid-2030s, and the share of automatable tasks involving social skills from less than 5% today to about 15% in the same time horizon.[17] The most relevant question to businesses, governments and individuals is not to what extent automation will affect current employment numbers, but how and under what conditions the global labour market can be supported in reaching a new equilibrium in the division of labour between human workers, robots and algorithms. Workforce planning and investment decisions taken today will play a crucial role in shaping this process.

Waves of automation have reshaped the global economy throughout history. Since the first and second industrial revolutions, organizations have bundled specific work tasks into discrete job roles, giving rise to distinct occupational profiles and optimizing the process of economic value creation based on the most efficient division of labour between humans and machines technologically available at the time.[18] As technological change and progress have increased workforce productivity by 're-bundling' work tasks into new kinds of jobs, so they have seen the decline of obsolete job profiles and the dynamic rise of wholly new ones, historically leaving the balance of net job and economic value creation firmly on the positive side.[19]

While the Fourth Industrial Revolution's wave of technological advancement will reduce the number of workers required to perform certain work tasks, responses by the employers surveyed for this report indicate that it will create increased demand for the performance of others, leading to new job creation. Moreover, while the

Figure 5: Ratio of human-machine working hours, 2018 vs. 2022 (projected)



Source: Future of Jobs Survey 2018, World Economic Forum.

current popular discourse is often fixated on technology that substitutes for humans, technology will also create new tasks—from app development to piloting drones to remotely monitoring patient health[20]—opening up opportunities for work never previously done by human workers,[21] highlighting that different types of new technology may bring about very different outcomes for workers.[22]

The rise of workplace automation in its many forms has the potential to vastly improve productivity and augment the work of human employees. Automation technology can help remove the burden of repetitive administrative work and enable employees to focus on solving more complex issues while reducing the risk of error, allowing them to focus on value-added tasks.[23] Examples of now well-established and almost unremarkable automation-based augmentation technology that hardly existed 25 years ago range from computer-aided design and modelling software used by architects, engineers and designers, to robotic medical tools used by doctors and surgeons, through to search engine technology that allows researchers to find more relevant information. In theory, these technologies take away tasks from workers, but in practice their overall effect is to vastly amplify and augment their abilities.[24]

The estimates of companies surveyed for this report provide a nuanced view of how human-machine collaboration might evolve in the time horizon up to 2022 (Figure 5). In today's enterprise, machines and algorithms most often complement human skills in information and data processing. They also support the performance of complex and technical tasks, as well as supplementing more physical and manual work activities. However, some work tasks have thus far remained overwhelmingly human: Communicating and interacting; Coordinating, developing, managing and advising; as well as Reasoning and decision-making. Notably, in terms of total working hours, in the aggregate no work task was yet estimated to be predominantly performed by a machine or an algorithm.

By 2022, this picture is projected to change somewhat. Employers surveyed for this report expect a deepening across the board of these existing trends, with machines and algorithms on average increasing their contribution to specific tasks by 57%. Relative to their starting point today, the expansion of machines' share of work task performance is particularly marked in Reasoning and decision-making; Administering; and Looking for and receiving job-related information. The majority of an organization's information and data processing and information search and transmission tasks will be performed by automation technology (Figure 5).

Based on one recent estimate, the next wave of labour-augmenting automation technology could lead to an average labour productivity increase across sectors of about 30% compared to 2015, with some significant variation by industry.[25] For employers, optimally integrating humans and automation technology will require an analytical ability to deconstruct the work performed in their organizations today into discrete elements—that is, seeing the work tasks of today's job roles as independent and fungible components—and then reconfiguring these components to reveal human-machine collaboration

Table 4: Comparing skills demand, 2018 vs. 2022, top ten

Today, 2018	Trending, 2022	Declining, 2022
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problem-solving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, math and active listening
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning, problem-solving and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning, problem-solving and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

Source: Future of Jobs Survey 2018, World Economic Forum.

opportunities that are more efficient, effective and impactful.[26] Among other things, success in this domain will require a strategic repositioning of the corporate human resource function and expanded organizational capabilities in data analysis and workforce analytics.[27]

For workers, improved productivity may allow them to re-focus their work on high-value activities that play to the distinctive strengths of being human. However, to unlock this positive vision, workers will need to have the appropriate skills that will enable them to thrive in the workplace of the future. And as discussed in detail in the next section, even for those who currently have these skills, the pace at which tasks are being augmented and skills are changing continues to accelerate.

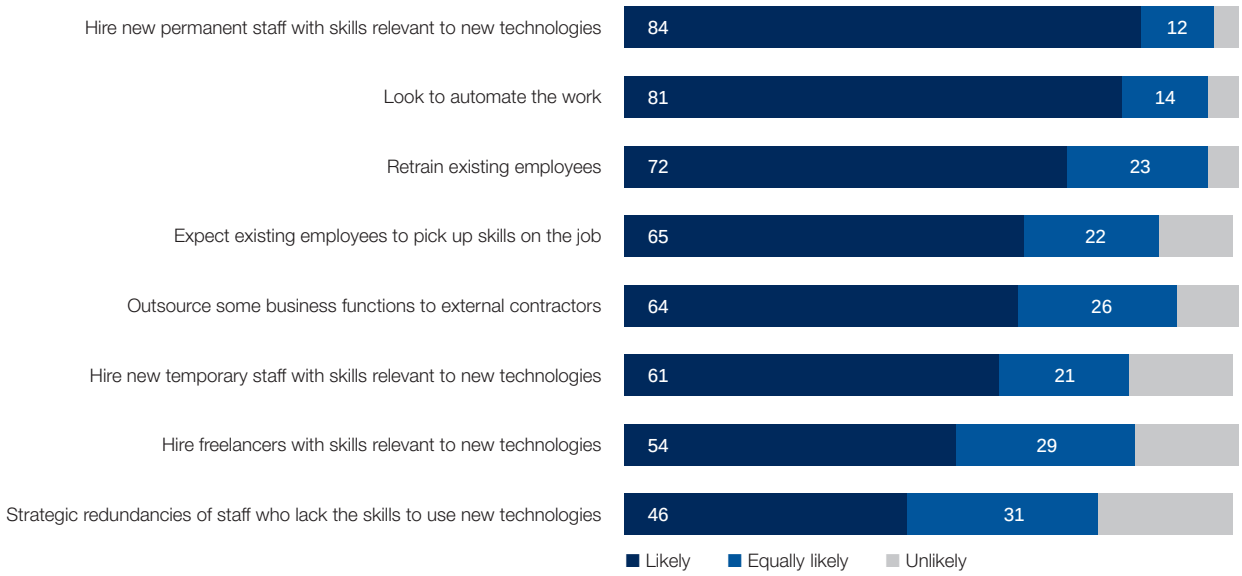
The reskilling imperative

Current shifts underway in the workforce will displace some workers while at the same time create new opportunities for others. However, maximizing the gains and minimizing the losses requires attention not just from policy-makers, but also coherent responses from companies to find win-win solutions for workers and for their bottom line. Leading research documents the potentially divergent impact of the introduction of automation technology, demonstrating how both job design (how tasks are organized into jobs) and employee's possession (or lack thereof) of skills complementing newly introduced technologies contribute to eventual outcomes for companies and workers.[28] Workers with in-demand skills ready for augmentation may see their wages and job quality increase considerably. Conversely, even if automation only affects a subset of the tasks within their job role, workers lacking appropriate skills to adapt to new technologies and move on to higher value tasks may see their wages and job quality suppressed by technology steadily eroding the value of their job, as it encroaches on the tasks required to perform it.[29] Therefore, central to the success of any workforce augmentation strategy is the buy-in of a motivated and agile workforce, equipped with futureproof skills to take advantage of new opportunities through continuous retraining and upskilling.[30] Given the wave of new technologies and trends disrupting business models and the changing division of labour between workers and machines transforming current job profiles, the vast majority of employers surveyed for this report expect that, by 2022, the skills required to perform most jobs will have shifted significantly. While these skill shifts are likely to play out differently across different industries and regions,[31] globally, our respondents expect average *skills stability*—the proportion of core skills required to perform a job that will remain the same—to be about 58%, meaning an average shift of 42% in required workforce skills over the 2018–2022 period.[32]

Key skills demand trends identified by our analysis include, on the one hand, a continued fall in demand for manual skills and physical abilities and, on the other hand, a decrease in demand for skills related to the management of financial and other resources as well as basic technology installation and maintenance skills (Table 4). Skills continuing to grow in prominence by 2022 include Analytical thinking and innovation as well as Active learning and learning strategies. The sharply increased importance of skills such as Technology design and programming highlights the growing demand for various forms of technology competency identified by employers surveyed for this report. Proficiency in new technologies is only one part of the 2022 skills equation, however, as 'human' skills such as creativity, originality and initiative, critical thinking, persuasion, and negotiation will likewise retain or increase their value, as will attention to detail, resilience, flexibility and complex problem-solving. Emotional intelligence, leadership and social influence as well as service orientation also see an outsized increase in demand relative to their current prominence.

Companies will need to pursue a range of organizational strategies in order to stay competitive in the face of rapidly changing workforce skills requirements. To do this, the skills of executive leadership and the human resources function will also need to evolve to successfully lead the transformation. With regard to likely approaches towards workers facing shifting skills demand, companies surveyed for this report specifically highlight three future strategies: hiring wholly new permanent staff already

Figure 6: Projected (2022) strategies to address shifting skills needs, by proportion of companies (%)



Source: Future of Jobs Survey 2018, World Economic Forum.

Note: The bars represent the proportion of responses by companies that stated that specific strategies were likely, equally likely or unlikely. Some companies abstained from answering the question. In such cases part of the bar remains blank (typically, 0–1% in the graph above).

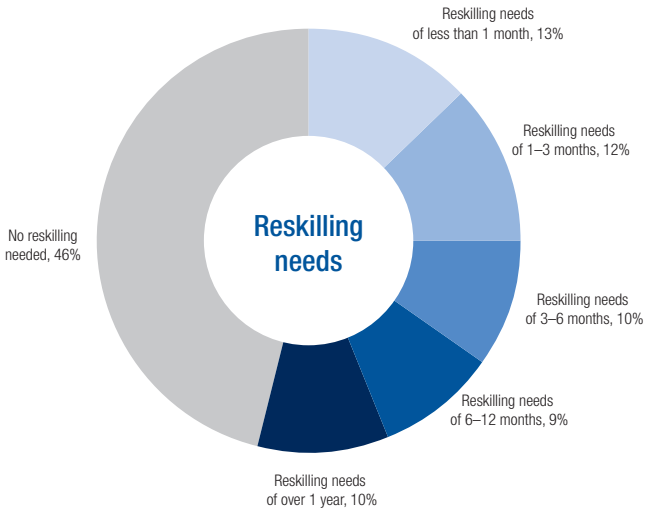
possessing skills relevant to new technologies; seeking to completely automate the work tasks concerned; and retraining existing employees (Figure 6). The likelihood of hiring new permanent staff with relevant skills is nearly twice the likelihood of strategic redundancies of staff lagging behind in new skills adoption. However nearly one-quarter of companies are undecided or unlikely to pursue the retraining of existing employees. Two-thirds expect workers to adapt and pick up skills in the course of their changing jobs. Between one-half and two-thirds are likely to turn to external contractors, temporary staff and freelancers to address their skills gaps.

Employers surveyed for this report estimate that, by 2022, no less than 54% of all employees will require significant reskilling and upskilling (Figure 7). Of these, about 35% are expected to require additional training of up to six months, 9% will require reskilling lasting six to 12 months, while 10% will require additional skills training of more than a year.

Respondents to our survey further indicate that they are set to prioritize and focus their reskilling and upskilling efforts on employees currently performing high value roles as a way of strengthening their enterprise's strategic capacity, with 54% and 53% of companies, respectively, stating they intend to target employees in key roles and in frontline roles which will be using relevant new technologies. In addition, 41% of employers are set to focus their reskilling provision on high-performing employees while a much smaller proportion of 33% stated that they would prioritize at-risk employees in roles expected to be most affected by technological disruption. In other words, those most in need of reskilling and upskilling are least likely to receive such training.

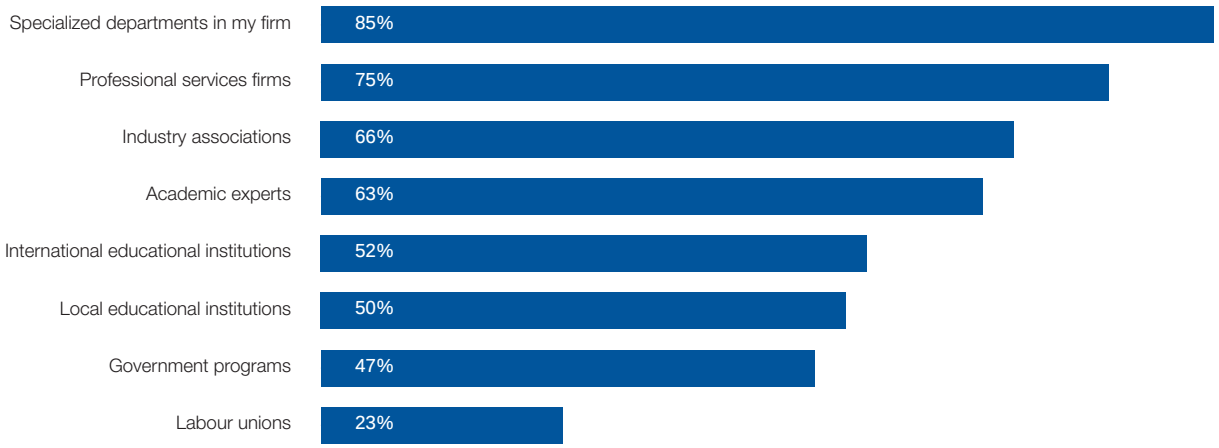
Our findings corroborate a range of recent research indicating that, currently, only about 30% of employees in today's job roles with the highest probability of technological disruption have received any kind of professional training over the past 12 months. In addition, they are on average more than three times less likely than

Figure 7: Expected average reskilling needs across companies, by share of employees, 2018–2022



Source: Future of Jobs Survey 2018, World Economic Forum.

Figure 8: Preferred partners in managing the integration of new technologies and workforce transition



Source: Future of Jobs Survey 2018, World Economic Forum.

employees in less exposed roles to have participated in any on-the-job training or distance learning and about twice less likely to have participated in any formal education.[33] Other recent research similarly finds that, currently, reskilling and upskilling efforts are largely focused on already highly-skilled and highly-valued employees.[34]

These findings are a cause for concern, given that making an inclusive culture of lifelong learning a reality is increasingly imperative for organizations and for workers whose growth strategies and job roles are being affected by technological change. In particular, they highlight that the bottom-line impact and business case for reskilling and upskilling investments remain somewhat unclear and require much greater attention. Time requirements, costs, success cases and appropriate delivery models for reskilling and upskilling are likely to look very different for different categories of job roles and workers.

To provide a preliminary picture, companies surveyed for this report highlight that, overwhelmingly, their key success metric for reskilling and upskilling initiatives is increased workforce productivity—chosen by 90% of respondent employers—followed by retention of high-skilled workers, enabling workers in frontline roles to make the best use of new technologies and increased employee satisfaction. Significantly smaller proportions of companies regard reskilling as a means of lowering recruitment costs, redeploying employees in disrupted job roles or as a way to increase the skills base of their medium- and lower-skilled workforce. In short, to date reskilling has been regarded by employers as a narrow strategy focused on specific subsets of employees, not as a comprehensive strategy to drive workforce transformation.

Finally, while companies themselves will need to take the lead in creating capacity within their organizations to support their transition towards the workforce of the future, the economic and societal nature of these challenges means that they will also increasingly need to learn to partner with other stakeholders for managing the large-scale retraining and upskilling challenges ahead. Tangible collaboration opportunities include partnering with educators to reshape school and college curricula, intra- and inter-industry collaboration on building talent pipelines, and partnerships with labour unions to enhance cross-industry talent mobility. Governments may likewise become key partners in creating incentives for lifelong learning, ensuring shared standards for retraining and strengthening safeguards for workers in transition.[35] However, more guidance and good practice learning opportunities will be needed. Currently, respondents to our survey expect to continue to primarily look to specialized internal departments to meet their retraining needs for the period up to 2022, with some supplementary support from professional services firms, industry associations and academic experts (Figure 8). Less than half of companies actively consider partnering with government programmes and slightly more than a fifth see labour unions as preferred partners.

Companies surveyed for this report anticipate that, over the 2018–2022 period, on average, around half of all retraining will be delivered through internal departments, about one quarter through private training providers and about one-fifth through public education institutions. About 34% of the retraining to be delivered directly by employers is expected to result in an accreditation recognized outside of the company in question. Expanding such systems for certifiable skills recognition could significantly promote the marketplace for corporate reskilling and upskilling in the near future and improve outcomes for workers. These findings highlight both the future role of companies as learning organizations and the range of possible reskilling and upskilling multistakeholder collaboration arrangements.

The Future of Jobs Across Industries

The future of jobs is not singular. It will diverge by industry and sector, influenced by initial starting conditions around the distribution of tasks, different investments in technology adoption, and the skills availability and adaptability of the workforce. As a consequence, different industries experience variation in the composition of emerging roles and in the nature of roles that are set to have declining demand.

Among the trends driving growth across industries over the 2018–2022 period, advances in mobile internet are likely to have a distinct impact in the Aviation, Travel & Tourism industry, the Financial Services & Investors industries, and in the Consumer industry. The rapid adoption of new technologies by consumers as well as advancements in cloud technology are set to drive growth in the Information & Communication Technologies industry, while the availability of big data is expected to have an even broader impact on the Financial Service & Investors and the Energy Utilities & Technologies industries. New energy supplies and technologies, in tandem with advances in computing power, are set to drive gains in the Energy Utilities & Technologies sector. Among non-technological drivers of business growth, increasing affluence in developing economies is poised to drive growth in the Aviation, Travel &Tourism; Global Health & Healthcare; and Chemistry, Advanced Materials & Biotechnology industries.

Table 5 on page 16 demonstrates the range of demand for the adoption of specific technologies. Robotic technology is set to be adopted by 37% to 23% of the companies surveyed for this report, depending on industry. Companies across all sectors are most likely to adopt the use of stationary robots, in contrast to humanoid, aerial or underwater robots. However, leaders in the Oil & Gas industry report the same level of demand for stationary and aerial and underwater robots, while employers in the Financial Services & Investors industry are most likely to signal the planned adoption of humanoid robots in the period up to 2022. Distributed ledger technologies are set to have a particular impact in the Financial Services industry, which promises to be an early adopter of the technology. In fact, 73% of respondents expect their enterprise to adopt its use. Another industry set to scale its adoption of distributed ledger technologies will be the Global Health & Healthcare industry. Machine learning is expected to be adopted across a range of industries, including banking and insurance, where it may disrupt risk prediction; in the medical field, where it may be used for advanced diagnosis; across the energy sector, where it may lead to predictive maintenance; and in the consumer sector, where it may enhance the industry's ability to model demand.

While technologies have the capacity to automate and potentially augment a variety of tasks across enterprises, this will vary by industry-specific capital investment, the risks associated with automating sensitive tasks, the unknown knock-on-effects of how machines and algorithms will perform the task, the presence of a longer-term workforce strategy, and the managerial challenges of re-orienting the operations of different enterprises. Additionally, many sectors face disruption and shifts in demand through non-technological factors, such as the effect of ageing in the Global Health & Healthcare industry. Efficiencies in healthcare technologies will thus become necessary innovations to meet the demographic changes afoot, freeing time spent in administration and record keeping for caregiving activities.[36]

The growth potential of new technological expansion is buffered by multi-dimensional skills gaps across local and global labour markets, and among the leadership of enterprises. Skills gaps among the local labour market are among the most cited barriers to appropriate technology adoption for a number of industries, but they are particularly strong concerns for business leaders in the Aviation Travel & Tourism, Information & Communication Technologies, Financial Services & Investors, and Mining & Metals industries. Companies in Global Health & Healthcare as well as Infrastructure industries are most likely to cite leadership skills gaps as significant barriers, while the Chemistry, Advanced Materials & Biotechnology and Information & Communication Technologies sectors report broad global labour market skills shortages.

There is a distinctive footprint of tasks performed across each industry. For example, on average, workers in the Mining & Metals industry spend the majority of their time in physical and manual tasks, while those in the Professional Services industry spend the majority of their time on tasks related to communicating and interacting. In the Oil & Gas, Infrastructure, and Chemistry, Advanced Materials & Biotechnology industries, the tasks that occupy today's workers for the largest proportion of their time focus on the performance of complex and technical activities. Administrative activities are particularly prominent in the Infrastructure industry as well in the Mining & Metals and Financial Services & Investors industries.

As industries make investments in new technologies, the impact on each industry as a whole is determined by the task composition of each sector and the desirability of automating or augmenting specific tasks. Existing research has highlighted that some industries remain labour-intensive in the production of goods and services, leading to low productivity growth.[37] If managed well, the augmentation of a range of tasks today can create the opportunity for new, higher productivity growth. For example, administering and physical tasks are often low value and low productivity tasks. In the current projections of companies surveyed for this report, administrative tasks in the Financial Services & Investors sector are set to be significantly replaced by machine labour. While today machines and algorithms perform 36% of the collective hours spent on this task, by 2022 this share will rise to 61%, with knock-on effects on the demand for Data Entry Clerks, Secretarial staff and Accounting staff. In the Energy and Consumer sectors, physical and manual

Table 5: Technology adoption by industry and share of companies surveyed, 2018–2022 (%)

	Overall	Automotive, Aerospace, Supply Chain & Transport	Aviation, Travel & Tourism	Chemistry, Advanced Materials & Biotechnology	Consumer	Energy Utilities & Technologies	Financial Services & Investors	Global Health & Healthcare	Information & Communication Technologies	Infrastructure	Mining & Metals	Oil & Gas	Professional Services
User and entity big data analytics	85	84	89	79	85	85	86	87	93	65	62	87	85
App- and web-enabled markets	75	76	95	71	88	65	89	80	93	53	50	61	74
Internet of things	75	82	95	58	73	85	65	67	86	76	50	83	74
Machine learning	73	87	79	58	82	77	73	80	91	53	69	70	74
Cloud computing	72	76	79	67	67	73	65	73	91	71	62	78	76
Digital trade	59	68	68	62	82	58	70	53	70	47	50	57	59
Augmented and virtual reality	58	71	68	50	48	65	59	67	72	59	62	65	53
Encryption	54	58	53	25	42	38	73	67	67	41	25	57	53
New materials	52	71	32	79	79	65	22	60	30	82	62	83	41
Wearable electronics	46	61	53	46	45	42	49	73	49	24	25	70	35
Distributed ledger (blockchain)	45	32	37	29	39	54	73	67	67	18	38	48	50
3D printing	41	61	21	58	42	54	19	53	35	41	50	57	29
Autonomous transport	40	74	58	54	39	46	16	20	44	41	50	30	41
Stationary robots	37	53	37	50	42	35	27	47	35	35	38	52	29
Quantum computing	36	29	32	25	33	46	43	33	44	24	19	43	41
Non-humanoid land robots	33	42	26	21	36	27	32	40	37	29	25	30	24
Biotechnology	28	18	0	42	52	42	11	87	23	12	44	39	24
Humanoid robots	23	29	26	17	18	8	35	13	33	12	25	13	24
Aerial and underwater robots	19	18	16	17	12	35	5	0	19	29	25	52	21

Source: Future of Jobs Survey 2018, World Economic Forum.

Table 6: Projected (2022) effects on the workforce by industry and proportion of companies (%)

	Overall	Automotive, Aerospace, Supply Chain & Transport	Aviation, Travel & Tourism	Chemistry, Advanced Materials & Biotechnology	Consumer	Energy Utilities & Technologies	Financial Services & Investors	Global Health & Healthcare	Information & Communication Technologies	Infrastructure	Mining & Metals	Oil & Gas	Professional Services
Modify value chain	59	82	44	71	83	78	56	67	55	78	44	87	60
Reduce workforce due to automation	50	48	50	38	57	56	56	47	55	33	72	52	37
Expand task-specialized contractors	48	52	50	42	51	52	44	33	57	56	56	52	51
Modify locations of operation	48	42	50	58	54	52	67	73	55	28	44	57	54
Expand the workforce	38	50	39	38	34	19	31	27	41	28	22	35	71
Bring financing on-board for transition	36	38	33	29	40	37	31	20	34	56	22	30	37
Expand workforce due to automation	28	20	50	29	23	19	25	20	52	22	33	26	57

Source: Future of Jobs Survey 2018, World Economic Forum.

work activities will also be replaced. Today, respectively 38% and 30% of such tasks in these two sectors are performed by machines and algorithms. By 2022, those rates are expected to be 56% and 50% respectively, with knock-on effects on demand for Assembly and Factory Workers, Cashiers, and Stock-Keeping Clerks. Distinctively, the Aviation Travel & Tourism and Information & Communication Technologies sectors are those most likely to venture into automating some complex and technical activities. For example, today 25% of labour in the Information & Communications Technology industry is performed by machines and algorithms, while 46% is projected for 2022.

All industries expect sizable skills gaps, stating that at least 50% of their workforce will require reskilling of some duration. According to respondents to the Future of Jobs Survey, more than 55% of workers across the Aviation, Travel & Tourism; Financial Services & Investors; Chemistry, Advanced Materials & Biotechnology; and Global Health & Healthcare sectors will need some reskilling. The Aviation, Travel & Tourism industry outlines the largest demand for reskilling, projecting that 68% of its workforce will require some reskilling. Further, companies in that industry project that 18% of the workforce will require reskilling lasting more than one year.

While most industry respondents expect to observe declining demand for a set of, often labour-intensive roles dominated by manual and routinized work, that decline is often counter-balanced by growth across other specializations. A critical concern that will affect all industries will be the imperative to reskill workers currently in roles that have declining prospects into ones with expanding prospects.

Many of the companies surveyed for this report project that, by 2022, they will both expand and contract parts of their current workforce, with expansion likely to offset the contraction. However, this balance looks different across different industry sectors. Mining & Metals industry respondents, alongside those from the Consumer and Information & Communication Technologies industries, expect to see a reduction in their workforce due to automation, while Professional Services industry respondents expect that the changes afoot are more likely to lead to an expansion of their workforce.

Projected adaptations specific to the skilling needs associated with these changes include the potential to buy, build, borrow or automate talent. In particular, many of the Future of Jobs Survey respondents highlighted that they are likely to hire new permanent staff with skills that are relevant to the adopted technologies. The broad mobility sector is most likely to look to automation as a way to solve its projected talent challenges, and is least likely to look to reskill current employees. In contrast, companies in the Global Health & Healthcare industry—in addition to the Chemistry, Advanced Materials & Biotechnology industry—are most likely to look to retrain existing workers.

The trusted partners with the potential to support industries in their transformation vary across three key groups: specialized departments within the companies in question, professional services firms and industry associations. A series of other potential stakeholders—education institutions, government programmes and labour unions—received less emphasis as possible partners in these transitions. The Oil & Gas, Mining & Metals, and Energy Utilities & Technology industries are more likely to look to industry associations to support their workforce transition. Companies in the Global Health & Healthcare sector name professional services firms as their primary support mechanism, but also name academic experts as their third-most important support pillar. Finally, Aviation, Travel & Tourism firms are most likely to name local education institutions as their third-most important support structure. Part 2 of this report contains distinct Industry Profiles that offer a deeper look at technology, jobs, tasks and skills trends within different sectors.

The Future of Jobs Across Regions

As the Fourth Industrial Revolution unfolds across the globe, the future of jobs can be expected to develop with both common and differentiated characteristics across different countries and regions of the world.[38] In the near term, our data shows that the mix of prevalent industries in different countries will result in different national combinations of the effects described in the previous section, **The Future of Jobs across Industries**. Additionally, as global companies choose to differentiate and locate specific job roles and economic activities in certain countries over others due to a range of strategic considerations, there will be a secondary effect on the future of jobs in a range of developed and emerging markets, highlighting the ongoing importance of global supply chains and multinational companies in shaping the structure of the global economy.[39,40]

With regard to the factors determining job location decisions, companies surveyed for this report overwhelmingly cite availability of skilled local talent as their foremost consideration, with 74% of respondents providing this factor as their key consideration. In contrast, 64% of companies cite labour costs as their main concern (Table 7). Notably, while we find some evidence of pure labour cost considerations being more important in emerging economies—with, for example, 74% of companies operating in South Africa and a similar share of companies operating in the Philippines highlighting this rationale, compared to 57% in the United Kingdom—skilled local talent availability remains the single most important factor behind job location decisions in these economies as well. A range of additional relevant factors—such as the flexibility of local labour laws, industry agglomeration effects or proximity of raw materials—were considered of lower importance relative to skilled local talent availability and labour cost considerations.

Table 7: Factors determining job location decisions, 2018–2022, by industry

Industry	Primary	Secondary	Tertiary
Overall	Talent availability	Labour cost	Production cost
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Labour cost	Quality of the supply chain
Aviation, Travel & Tourism	Talent availability	Organization HQ	Labour cost
Chemistry, Advanced Materials & Biotechnology	Talent availability	Production cost	Labour cost
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Talent availability	Labour cost	Production cost
Financial Services & Investors	Talent availability	Labour cost	Organization HQ
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Infrastructure	Labour cost	Talent availability	Production cost
Mining & Metals	Labour cost	Production cost	Talent availability
Oil & Gas	Talent availability	Production cost	Labour cost
Professional Services	Labour cost	Talent availability	Geographic concentration

Source: Future of Jobs Survey 2018, World Economic Forum.

Furthermore, our analysis finds some industry-specific variation with regard to overall labour cost sensitivity relative to skilled local talent availability considerations. For example, across countries and regions, Consumer, Energy Utilities & Technologies, Financial Services & Investors, Infrastructure, and Mining & Metals are industries that tend to emphasize labour cost over skilled local talent availability. In contrast, the Automotive, Aerospace, Supply Chain & Transport; Chemistry, Advanced Materials & Biotechnology; Global Health & Healthcare; and Information & Communication Technologies industries tend to place a larger priority on skilled local talent availability (Table 7).

While a detailed discussion of the potential impact of automation on manufacturing in different countries and regions—and the potential for 're-shoring'—is beyond the scope of this report, it is worth noting the link between labour costs, skills and investment in automation technologies in advanced and emerging economies. For example, according to one recent study, in 1997, manufacturing value-added per dollar of labour cost was twice as high in Mexico than in the United States. By 2013, this gap had shrunk to less than 15%.[41] Provided simultaneous investment in automation technology and labour augmentation in advanced economies continues apace over the 2018–2022 period, it is not inconceivable that shifting comparative advantage in labour costs will affect the industrial structure of economies such as Vietnam through re-shoring of work tasks in sectors such as textiles, apparel, footwear or electronics assembly.[42] Indeed, more than half of companies surveyed for this report expected that by 2022 they would be considering adjusting the composition of their value chains in response to the adoption of new technologies, and just under half expected targeting new talent by modifying the location of their operations.

At least two key factors suggest that the grounds for optimism may outweigh concerns. Firstly, even if factory automation and labour augmentation in advanced industrial economies might lead to some re-shoring over the 2018–2022 period, many emerging economies are increasingly shifting toward a domestic consumption driven growth model, with rising local middles classes generating increased demand for goods and services traditionally intended for export.[43] Secondly, as discussed in the section **From Automation to Augmentation,** new technologies give rise to new job roles, occupations and industries, with wholly new types of jobs emerging to perform new work tasks related to new technologies. Comparing occupational structures across advanced and emerging economies suggests that there is considerable scope for job growth in many sectors in the latter. For example, healthcare and education jobs provide 15% of total employment in the United States, and business services such as finance and real estate provide 19%, whereas, in emerging economies in East Asia and the Pacific, the respective shares are 3.5%–6.0% and 1.5%–6.0%, suggesting considerable scope for job growth.[44]

However, in order to result in a positive outcome for workers and businesses alike in the midst of these geographically differentiated shifts, lifelong learning and national reskilling and upskilling plans for countries at every stage of economic development are paramount. Part 2 of this report offers a deeper look at technology, jobs, tasks and skills trends within different regions and countries through distinct Country and Regional Profiles. They are intended as a practical guide to exploring these issues in greater granularity and identifying opportunities for countries to build up their future talent pool in a targeted manner. The information provided might also prove useful to evaluate

shifting comparative advantage due to new technologies that might affect future company and industry location decisions in relation to various countries in question.

Some of the most frequently cited job roles expected to experience an increase in demand across the geographies covered by the report over the 2018–2022 period—as highlighted by surveyed employers with operations in the respective country or region—include Software and Applications Developers, Data Analysts and Scientists, as well as Human Resources Specialists, Sales and Marketing Professionals and specialized Sales Representatives in virtually all world regions. Region-specific roles expected to be in demand include Financial and Investment Advisers in East Asia and the Pacific and Western Europe; Information Security Analysts in Eastern Europe; Assembly and Factory Workers in Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa; and Electrotechnology Engineers in North America.

Crucial to taking advantage of these emerging job creation opportunities across countries and regions will be the existence of a well-skilled local workforce and of national reskilling and upskilling ecosystems equipped to support local workers to keep abreast of technological change and shifting skills needs. As discussed in the section **The Reskilling Imperative** (see Figure 7 on page 13), across all countries and regions, employers surveyed for this report expect that significant reskilling will be needed by a large share of the global workforce over the 2018–2022 period. The expected average timeframe required to retrain or upskill affected workers—either in order to equip the country's workforce with the skills needed to seize new opportunities created by the trends and disruptions experienced by businesses operating in the country in question, or in order to avoid losing competitiveness due to the obsolescence of the workforce's existing skillsets—ranges from 83 day for companies located in Switzerland to 105 days for companies located in France (Figure 11).

A Look to the Recent Past *(in Collaboration with LinkedIn)*

While the Future of Jobs Survey is designed to look to the near-term future based on the views of the leaders shaping the decisions affecting the future of work, it is equally important to develop a clear sense of recent trends and consider their projections into the future. The World Economic Forum's data collaboration with LinkedIn helps trace trends in hiring for a range of roles across the period 2013–2017. This data reveals the recent past and the adaptation that has already occurred across roles, impacting the lives and livelihoods of a variety of professionals.

An average rate of change was calculated to reveal the share of hiring for each role from LinkedIn's 653 codified occupations. LinkedIn analysts expressed the monthly hires of any one job as a proportion of all hires across jobs in each relevant industry within any one calendar month. A linear regression line was fitted to aggregate the generalized trend and to reveal multi-year trends that point to the prioritization of hiring across industries. The resulting lists of roles and scale of change are featured in Figures 9 and 10 (on pages 20 and 21) and reveal, across industries and geographies, the roles that in the aggregate experienced the greatest upward or downward trend in demand from 2013–2017. The trends highlight business prioritization of new hires, namely the roles which employers believed to be the most appropriate investments to prepare their enterprises for success over the relevant period.

The data reveals that the Basics and Infrastructure industry has experienced a boom in real estate brokerage hires, but a decreasing relative demand for engineering roles and for technicians of various kinds. In the Consumer industry, the demand for Sales Managers was outpaced by demand for Marketing Managers and Software Engineers, while the inverse was true for the Energy industry cluster, where the demand for Managerial and Sales personnel has outpaced demand for Technicians and Engineers. A similar trend can be observed in the Information and Communication Technology industry. Here, relative demand for Systems Administrators has been outpaced by an increase in hires specializing in Experience Design and Marketing. In the Healthcare sector, more specialized roles in nutrition and mental health have experienced rising demand in contrast to generalist roles such as Nursing staff or Medical Officers. A slowdown in hiring trends within the Professional Services sector appears to have distinctively impacted creative, editorial and journalistic roles, all reflecting recent disruptions to the publishing industry. A downward trend among the hiring profile of journalistic professions has seen a matching increase in new hires across broader content writing roles.

Across all regions, digital, marketing and talent-related professions dominate the list of roles that have experienced upward hiring trends alongside marketing specialists, and professionals specializing in software engineering, Data Analysts, User Experience Designers and Human Resources Specialists.

The East Asia and the Pacific region has experienced falling demand for more traditional technical professions such as Engineering, and that trend is mirrored in the Middle East and North Africa region. In a similar fashion, historic hiring trends reveal a decline in hires of technical professions, such as Database Administrators and Electrical Engineers in South Asia. The Latin America and Caribbean and Sub-Saharan Africa regions saw a decline in new hires into roles focused on accounting, administrative activities and in supply chain specialization. Finally, Western Europe has experienced a slowdown in the relative hiring of creative professionals, reflecting recent disruptions in the publishing industry.

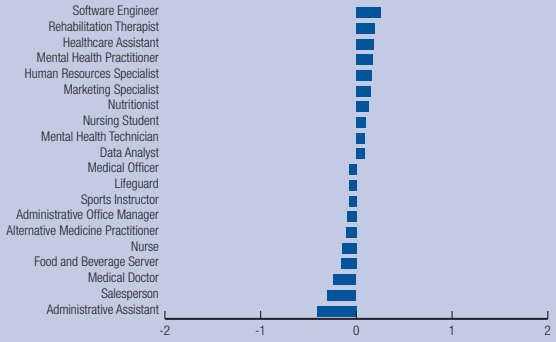
(Continued on next page)

A Look to the Recent Past *(in Collaboration with LinkedIn) (cont'd.)*

Figure 9: Top ten most emerging and declining roles between 2013–2017 as observed in hiring trends, by industry *(rate of change)*

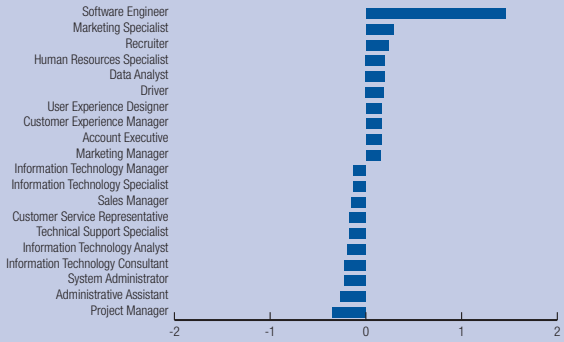
Basics and Infrastructure

Healthcare



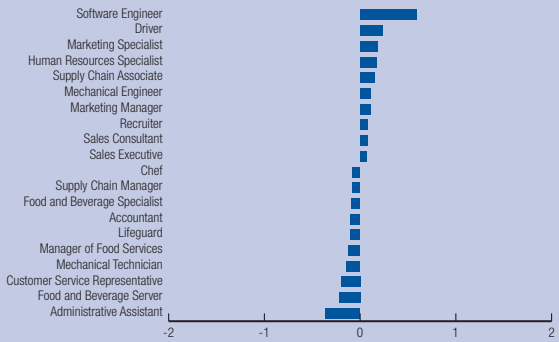
Consumer

Information and Communication Technology

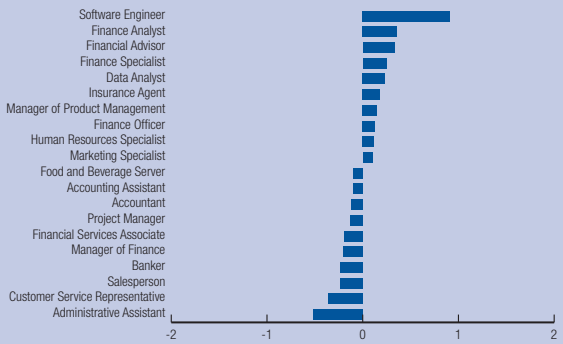


Energy

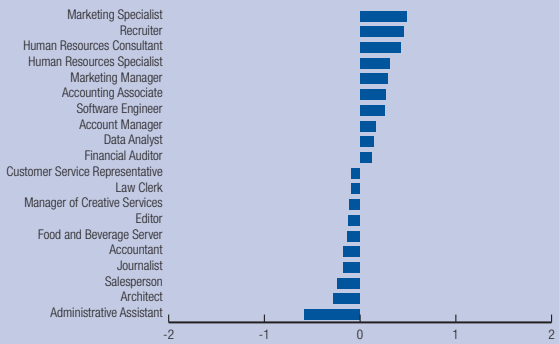
Mobility



Financial Services



Professional Services



Source: LinkedIn.

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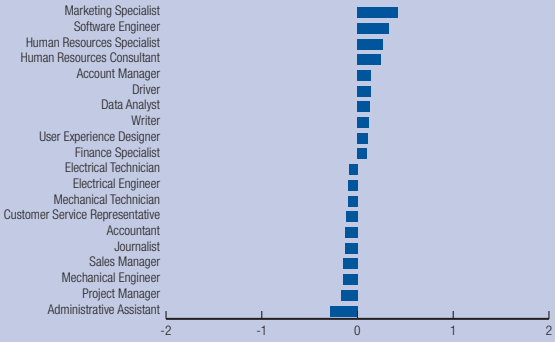
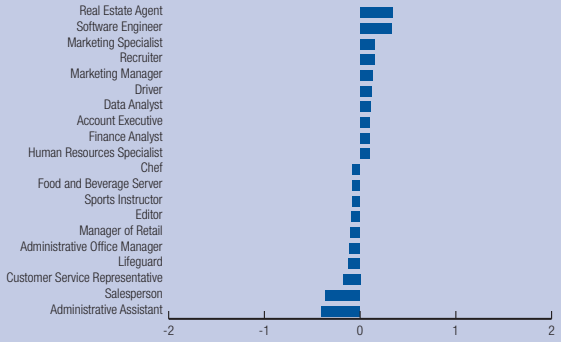
A Look to the Recent Past *(in Collaboration with LinkedIn) (cont'd.)*

Figure 10: Top ten most emerging and declining roles between 2013–2017 as observed in hiring trends, by region *(rate of change)*

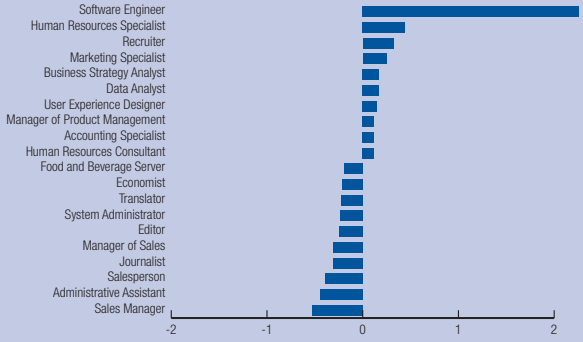
East Asia and the Pacific



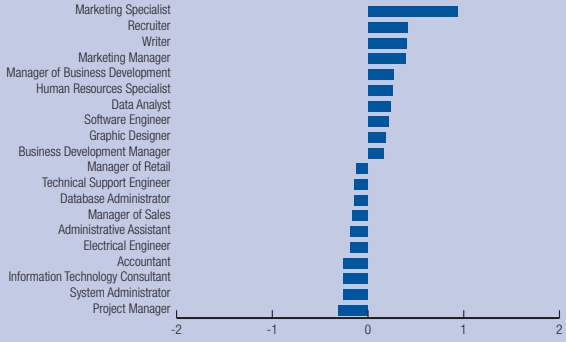
North America



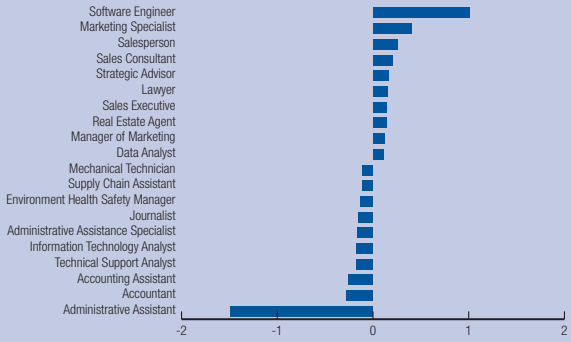
Eastern Europe and Central Asia



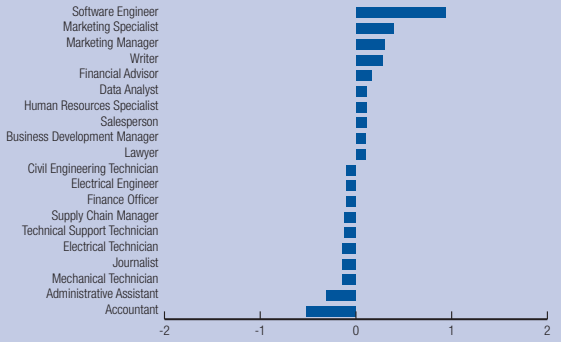
South Asia



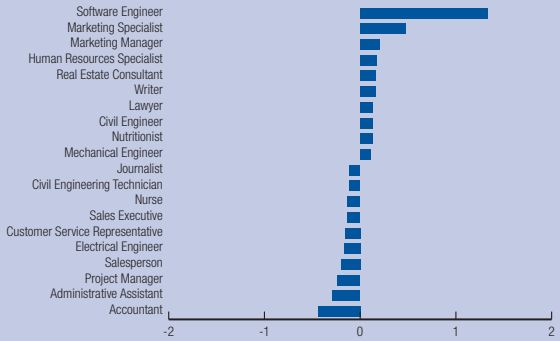
Latin America and the Caribbean



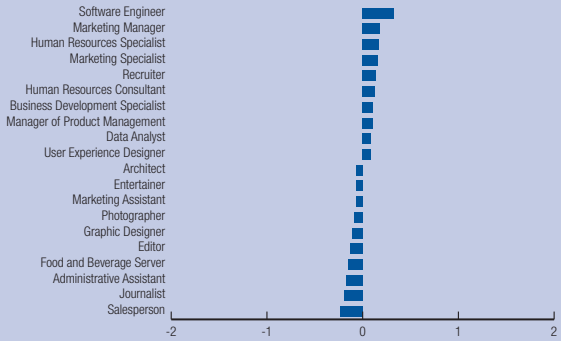
Sub-Saharan Africa



Middle East and North Africa

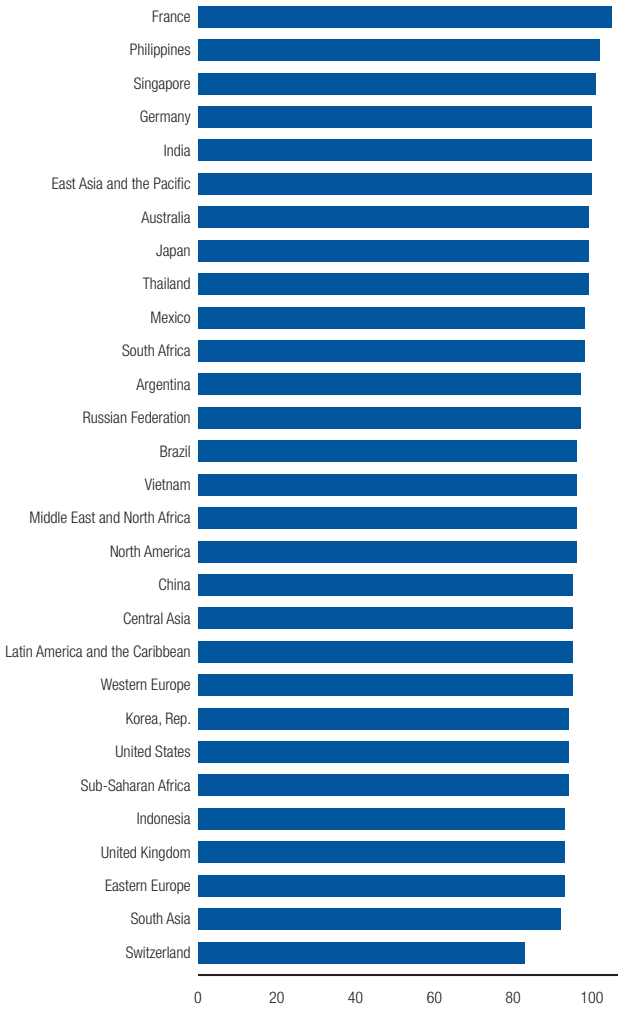


Western Europe



Source: LinkedIn.

Figure 11: Average reskilling needs in days, by country and region, 2018–2022



Source: Future of Jobs Survey 2018, World Economic Forum.

For governments and businesses alike, there is a significant opportunity in strengthening cross-sectoral multistakeholder collaboration to promote corporate reskilling and upskilling among employers in affected countries and regions. Responses by the companies surveyed for this report indicate that, currently, employers expect to primarily seek out the support of their own internal departments as well as private training providers to deliver required retraining and upskilling programmes over the 2018–2022 period. In contrast, across many regions, the least sought-after partners are local education institutions, government programmes and labour unions. This somewhat narrow field of envisaged collaboration partners highlights both an opportunity and a clear need for expanding the range of creative and innovative multistakeholder solutions.

Conclusions

The new labour market taking shape in the wake of the Fourth Industrial Revolution holds both challenges and opportunities. As companies begin to formulate business transformation and workforce strategies over the course of the 2018–2022 period, they have a genuine window of opportunity to leverage new technologies, including automation, to enhance economic value creation through new activities, improve job quality in traditional and newly emerging occupations, and augment their employees' skills to reach their full potential to perform new high value-added work tasks, some of which will have never before been performed by human workers. The business case for such an 'augmentation strategy' is becoming increasingly clear—and, we expect, will receive progressively more attention over the coming years, including through upcoming work by the World Economic Forum's Centre for the New Economy and Society.

At the same time, technological change and shifts in job roles and occupational structures are transforming the demand for skills at a faster pace than ever before. Therefore, imperative for achieving such a positive vision of the future of jobs will be an economic and societal move by governments, businesses and individuals towards agile lifelong learning, as well as inclusive strategies and programmes for skills retraining and upgrading across the entire occupational spectrum. Technology-related and non-cognitive soft skills are becoming increasingly more important in tandem, and there are significant opportunities for innovative and creative multistakeholder partnerships of governments, industry employers, education providers and others to experiment and invest in new types of education and training provision that will be most useful to individuals in this new labour market context.

As this new labour market takes shape over the 2018–2022 period, governments, businesses and individuals will also find themselves confronted with a range of wholly new questions. For example, as employment relationships increasingly shift towards temporary and freelancing arrangements, how can we ensure that individuals receive the support and guidance they need to acquire the right skills throughout their working lives? As employers are deconstructing traditional job roles and re-bundling work tasks in response to new technologies, how can they minimize the risks and best leverage new partnerships with resources such as online freelancers and talent platforms?[45] And how can they best ensure such task re-bundling does not inadvertently lead to new forms of job polarization through 'task segregation', whereby specific groups of workers are disproportionately allocated the most or least rewarding work tasks?[46]

While it is beyond the scope of this report to attempt to provide comprehensive answers to all of the above questions, a range of immediate implications and priorities stand out for different stakeholders.

For **governments**, firstly, there is an urgent need to address the impact of new technologies on labour markets through upgraded education policies aimed at rapidly raising education and skills levels of individuals of all ages,

particularly with regard to both STEM (science, technology, engineering and mathematics) and non-cognitive soft skills, enabling people to leverage their uniquely human capabilities. Relevant intervention points include school curricula, teacher training and a reinvention of vocational training for the age of the Fourth Industrial Revolution, broadening its appeal beyond traditional low- and medium-skilled occupations.[47] Secondly, improvements in education and skills provision must be balanced with efforts on the demand side. Governments can help stimulate job creation through additional public investment as well as by leveraging private investments through blended finance or government guarantees. The exact nature of desirable investments will vary from country to country. However, over the coming years, there is enormous scope and a clear unmet need in creating the hard and soft infrastructure to power the Fourth Industrial Revolution—from digital communication networks to renewable and smart energy grids to smart schools and hospitals to improved care homes and childcare facilities.[48] Thirdly, to the extent that new technologies and labour augmentation will boost productivity, incomes and wealth, governments may find that increased tax revenues provide scope to enhance social safety nets to better support those who may need support to adjust to the new labour market. This could be achieved through reforming and extending existing social protection schemes, or through moving to a wholly new model such as the idea of basic income and basic services. Learning from pilot schemes of this kind—in addition to those currently underway in places such as the Netherlands, various American and Canadian states, Kenya, India and Brazil—will be critical for all governments over the course of the 2018–2022 period.[49]

For **industries**, firstly, it will pay to realize that—as competition for scarce skilled talent equipped to seize the opportunities of the Fourth Industrial Revolution intensifies and becomes more costly over the coming years—there is an opportunity to support the upskilling of their current workforce toward new (and technologically reorganized) higher-skilled roles to ensure that their workforce achieves its full potential. Our findings indicate that, to date, many companies intend to mostly limit their skills training provision over the 2018–2022 period to employees performing today's in-demand job roles, rather than thinking more long-term and creatively. Clearly, a more inclusive and proactive approach will be needed—to both increase the availability of future skills and address impending skills scarcity, and to enable a wider range of workers to share in the gains from new technologies and work more effectively with them through skills augmentation. Secondly, the need to ensure a sufficient pool of appropriately skilled talent creates an opportunity for businesses to truly reposition themselves as learning organizations and to receive support for their reskilling and upskilling efforts from a wide range of stakeholders. One promising model involves new forms of professional skills certification similar to existing schemes delivered by a range of companies in the information technology sector. By establishing objective and marketable credentials for a large variety of emerging job roles, such schemes could help improve the focus of corporate training programmes, increase labour market flexibility, and create clear skills and performance measures to help employers screen candidates and certified workers to command skills premiums.[50] Thirdly, with the increasing importance of talent platforms and online workers, conventional industries, too, should be thinking strategically how these action items could be applied to the growing 'gig' and platform workforces as well.[51]

For **workers**, there is an unquestionable need to take personal responsibility for one's own lifelong learning and career development. It is also equally clear that many individuals will need to be supported through periods of job transition and phases of retraining and upskilling by governments and employers. For example, lifelong learning is becoming a rich area of experimentation, with several governments and industries looking for the right formula to encourage individuals to voluntarily undergo periodic skills upgrading.[52] Similarly, while a fully-fledged universal basic income may remain politically and economically unfeasible or undesirable over the 2018–2022 period, some variants or aspects of the idea—such as providing a 'universal lifelong learning fund' for individuals to draw on as needed—might receive increasing attention over the coming years.[53] Solutions are likely to vary by country and to depend on local political, economic and social circumstances.

Ultimately, the core objective for governments, industries and workers alike should be to ensure that tomorrow's jobs are fairly remunerated, entail treatment with respect and decency and provide realistic scope for personal growth, development and fulfilment.[54] It is our hope that this new edition of the World Economic Forum's *Future of Jobs Report* provides both a call to action and a useful tool for proactively shaping the future of jobs to realize this vision.

Notes

1 World Economic Forum, *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*, 2016. For an overview of some of this recent research, see: Balliester, Thereza and Adam Elsheikhi, *The Future of Work: A Literature Review*, ILO Research Department Working Paper No. 29, International Labour Organization, 2018.

2 African Development Bank (AFDB), Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), and Inter-American Development Bank (IDB), *The Future of Work: Regional Perspectives*, 2018.

3 According to the International Labour Organization's literature review, existing research on the future of work covers a wide range of topics, with a particular focus on technological innovations and inequality. Aspects that would merit additional analysis include the impact of demographics and environmental changes and, '[with] regard to the future of job creation and destruction, projections on the impact of automation on agriculture would be essential … particularly for developing countries'; Balliester, and Elsheikhi, *The Future of Work: A Literature Review*.

4 Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*, 2018.

5 According to an estimate by Bain & Company, based primarily on the rapidly declining cost of robotic dexterity for service applications, humanoid robots are likely to reach commercialization in the early 2020s, specifically creating 'a strong business case for the automation of many tasks in restaurant kitchens and bars'; see: Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*.

6 For example, 'cobots'—robotic helper units installed alongside human workers to enhance their productivity and often costing less than one-quarter the price of traditional robots—are set to have a large commercial and workforce impact over the coming years, being well-placed for deployment in many parts of the service sector as yet largely untouched by workplace automation; see: Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*.

7 See, for example, the differing perspectives provided by: Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*; McKinsey & Company, *Jobs lost, jobs gained: Workforce Transitions in a Time of Automation*, McKinsey Global Institute (MGI), 2017; and PwC, *Will robots really steal our jobs? An international analysis of the potential long-term impact of automation*, 2018.

8 As noted by a recent Bain & Company study, while public reaction to new technologies is likely to vary substantially from one country to the next, thereby accelerating or decelerating their adoption, differences in public policies toward new technologies such as automation may be harder to sustain if their applications are tradeable. For example, if London were to deregulate the application of fully autonomous machine learning algorithms in financial markets, competitive forces are likely to put greater pressure on technology regulators in New York to follow suit. By contrast, if London were to permit coffee shops more generous labour automation leeway than New York, differences are more likely to remain localized; see: Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*.

9 These extrapolated figures are based on employers' current projections for the set of roles with increasing, declining and stable demand in the period up to 2022, which were estimated by employers as a share of each enterprise's total workforce. The figures were then applied to the International Labour Organization's estimates and projections of global non-agricultural employment in both 2018 and 2022, adjusted for the estimated share of total employment represented by this report's respondent data, i.e. large businesses. The figures used for estimating the global share of large business employment are based on established estimates by the World Bank, US Bureau of Labor Statistics and Eurostat, holding the distribution of firm size constant between 2018 and 2022.

10 Barclays, *Robots at the gate: Humans and technology at work*, 2018.

11 Ibid.

12 Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*.

13 See: Ton, Zeynep and Sarah Kalloch, *Transforming Today's Bad Jobs into Tomorrow's Good Jobs*, Harvard Business Review, June 2017; Deloitte, *Reconstructing Jobs: Creating good jobs in the age of artificial intelligence*, 2018.

14 Davenport, Thomas and Julia Kirby, *Beyond Automation*, Harvard Business Review, June 2015.

15 See for example: Arntz, Melanie, Terry Gregory and Ulrich Zierahn, *The risk of automation for jobs in OECD countries: a comparative analysis*, OECD Social, Employment and Migration Working Papers No 189, Organisation for Economic Cooperation and Development (OECD), 2016; McKinsey Global Institute, *A Future That Works: Automation, Employment, and Productivity*, McKinsey Global Institute (MGI), 2017; PwC, *Will robots really steal our jobs? An international analysis of the potential long term impact of automation*. For a range of relevant additional considerations, see: van der Zande, Jochem, et al., *The Substitution of Labor: From technological feasibility to other factors influencing job automation*, Innovative Internet: Report 5, Stockholm School of Economics Institute for Research, 2018.

16 McKinsey Global Institute, *A Future That Works: Automation, Employment, and Productivity*.

17 PwC, *Will robots really steal our jobs? An international analysis of the potential long term impact of automation*; the three waves of workforce automation identified by the report consist of an *algorithmic wave* (to early 2020s; involving 'automation of simple computational tasks and analysis of structured data, affecting data-driven sectors such as financial services'); an *augmentation wave* (to late 2020s; involving 'dynamic interaction with technology for clerical support and decision making … including robotic tasks in semi-controlled environments such as moving objects in warehouses); and an *autonomous wave* (to mid-2030s; involving 'automation of physical labour and manual dexterity, and problem-solving in dynamic real-world situations that require responsive actions, such as in transport and construction').

18 A thought-provoking empirical perspective on this process is provided by: Cohen, Lisa, "Assembling Jobs: A Model of How Tasks Are Bundled Into and Across Jobs", *Organization Science*, vol. 24, no. 2, 2012.

19 Autor, David, "Why Are There Still So Many Jobs? The History and Future of Workplace Automation", *Journal of Economic Perspectives*, vol. 29, no. 3, 2015, pp. 3–30.

20 For example, since its launch in 2008, developers have earned more than US$86 billion through Apple's App Store platform, and app development is estimated to have created more than 1.7 million jobs in the United States and more than 2 million jobs in Europe; see: Apple, *App Store kicks off 2018 with record-breaking holiday season*, https://www.apple.com/newsroom/2018/01/app-store-kicks-off-2018-with-record-breaking-holiday-season, 2018; Mandel, M., *U.S. App Economy Jobs Update*, Progressive Policy Institute, http://www.progressivepolicy.org/blog/u-s-app-economy-update, 2017; and Mandel, M., *Update on European App Economy jobs*, Progressive Policy Institute, http://www.progressivepolicy.org/blog/update-on-european-app-economy-jobs, 2018.

21 Dellot, Benedict, "Why automation is more than just a job killer", *RSA Blog*, 20 July 2018, https://www.thersa.org/discover/publications-and-articles/rsa-blogs/2018/07/the-four-types-of-automation-substitution-augmentation-generation-and-transference. The RSA, a British think tank, accordingly distinguishes four types of automation: (1) *substitution* ('technology taking on a task that would [otherwise have been] be undertaken by a worker'; (2) *augmentation* ('[technology] expand[ing] the capability of workers, allowing them to achieve more and better-quality work in a shorter space of time'); (3) *generation* ('[technology] generat[ing] tasks that were never done by humans previously … creat[ing] work rather than captur[ing] it from others'); (4) *transference* ('technology shift[ing] responsibility for undertaking a task from workers to consumers. Self-service checkouts, for instance, have not done away with the job of processing items through tills. Instead they've merely passed on the responsibility to shoppers. … This form of automation typically relies on … sophisticated UX and UI Design'); ibid.

22 An innovative effort to distinguish between labour-substituting and labour-augmenting technologies—based on 78 individual tools and technologies—is provided by: Nedelkoska, Ljubica and Glenda Quintini, *Automation, skills use and training*, OECD Social, Employment and Migration Working Papers, No. 202, OECD, http://dx.doi.org/10.1787/2e2f4eea-en, 2018.

23 KPMG, *The augmented workforce*; Cognizant, *The Robot and I: How New Digital Technologies Are Making Smart People and Businesses Smarter by Automating Rote Work*, 2015.

24 Dellot, *Why automation is more than just a job killer*.

25 Measured in incremental additional US$ of gross output per worker, i.e. excluding baseline forecasts of labour productivity growth; Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*.

26 Jesuthasan, Ravin and John Boudreau, *Thinking Through How Automation Will Affect Your Workforce*, Harvard Business Review, April 2017; also see: Jesuthasan, Ravin, "You may not be a disrupter, but you might find opportunities in the gig economy", *Willis Towers Watson Blog*, 24 July 2017, https://www.willistowerswatson.com/en/insights/2017/07/insights-gig-economy.

27 Shook, Ellyn and Mark Knickrehm, *Harnessing Revolution: Creating the Future Workforce*, Accenture Strategy, 2017.

28 Autor, David, Frank Levy and Richard Murnane, *Upstairs, Downstairs: Computer-Skill Complementarity and Computer-Labor Substitution on Two Floors of a Large Bank*, NBER Working Paper No. 7890, National Bureau of Economic Research, 2000.

29 Barclays, *Robots at the gate: Humans and technology at work*.

30 Shook and Knickrehm, *Harnessing Revolution: Creating the Future Workforce*.

31 For a detailed analysis, see the sections The Future of Jobs across Industries and The Future of Jobs across Regions; also see: McKinsey & Company, *Skill Shift: Automation and the Future of the Workforce*, Discussion Paper, McKinsey Global Institute (MGI), 2018.

32 For a more extensive discussion of the concept of *skills stability*, see: World Economic Forum, *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*, 2016 and CEDEFOP, *Briefing Note: Preventing skill obsolescence*, 2012.

33 Nedelkoska and Quintini, *Automation, skills use and training*.

34 McKinsey & Company, *Skill Shift: Automation and the Future of the Workforce*.

35 Ibid.

36 Ibid.

37 See: Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*; McKinsey & Company, *Skill Shift: Automation and the Future of the Workforce*; Barclays, *Robots at the gate: Humans and technology at work*.

38 For a recent comprehensive overview, see: African Development Bank (AFDB), Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), Inter-American Development Bank (IDB), *The Future of Work: Regional Perspectives,* 2018.

39 Nedelkoska and Quintini, *Automation, skills use and training*.

40 See, for example: Baldwin, Richard, *The Great Convergence: Information Technology and the New Globalization*, Harvard University Press, 2016; Reijnders, Laurie S.M. and Gaaitzen de Vries, *Job Polarization in Advanced and Emerging Countries: The Role of Task Relocation and Technological Change within Global Supply Chains*, GGDC Research Memorandum 167, University of Groningen-Groningen Growth and Development Centre, 2017.

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45 Jesuthasan, "You may not be a disrupter, but you might find opportunities in the gig economy".

46 Chan, Curtis and Michael Anteby, "Task Segregation as a Mechanism for Within-job Inequality: Women and Men of the Transportation Security Administration", *Administrative Science Quarterly*, vol. 61, no. 2, 2016, pp. 184–216.

47 The Economist Intelligence Unit and ABB, *The Automation Readiness Index: Who is Ready for the Coming Wave of Automation*, 2018.

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49 PwC, *Will robots really steal our jobs? An international analysis of the potential long term impact of automation*.

50 Bain & Company, *Labor 2030: The Collision of Demographics, Automation and Inequality*.

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52 "Singapore, for example, is experimenting with funding 'individual learning accounts', which adults use to support training courses throughout their lives. Germany's Federal Ministry of Labour and Social Affairs is examining a similar scheme, as well as a modified form of "employment insurance" to fund skills upgrading throughout people's lives"; see: The Economist Intelligence Unit and ABB, *The Automation Readiness Index: Who is Ready for the Coming Wave of Automation*.

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Appendix A: Report Methodology

Changes to jobs and skills are set to have large-scale effects on companies, government and individuals across the global community. What does the future hold? How can you find the right talent to ensure growth? How can you make informed and socially conscious decisions when faced with major disruptions to jobs and skills?

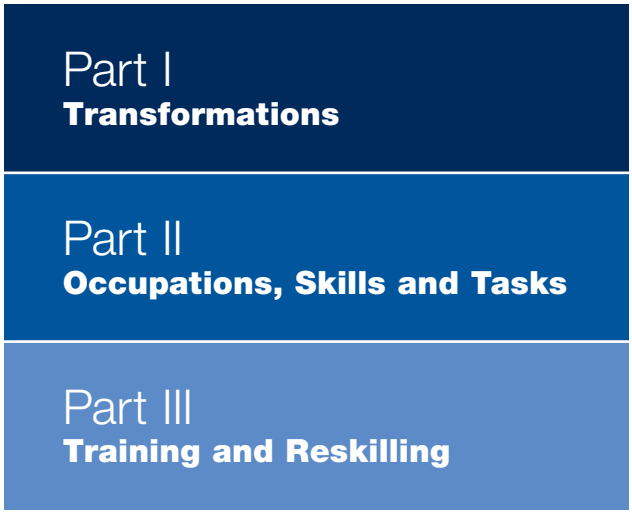
The analysis that forms the basis of this report is the result of an extensive survey of Chief Human Resources and Chief Executive Officers of leading global employers which aims to give specificity to these discussions. The survey aims to capture executives' current planning and projections related to jobs and skills in the period leading up to 2022.

Survey Design

There are three core concepts that are key to the construction of the Future of Jobs Survey: job roles, tasks and skills. Task are defined as the actions necessary to turn a set of inputs into valuable outputs. As such, tasks can be considered to form the content of jobs. Skills, on the other hand, are defined as the capabilities that are needed to complete a task. In essence, tasks are what needs to be done and skills define the capacity to do them.

The original Future of Jobs Survey employed to produce the first *Future of Jobs Report*, in 2016, was informed by an extensive literature review on the various dimensions covered by the survey, and by continuous consultation with leading experts from academia, international organizations, business and civil society through the World Economic Forum's Global Agenda Council on the Future of Jobs and Global Agenda Council on Gender Parity, which served as partners and advisory bodies to the study. This second edition of the survey adjusted that approach on the basis of lessons learned from that first endeavour.

Figure A1: Future of Jobs Survey 2018 framework



Source: Future of Jobs Survey 2018, World Economic Forum.

The updated 2018 survey now consists of three interrelated parts. Part I maps the trends that are set to positively and negatively impact business growth, the technologies that are likely to play a part in that expansion, the rationale and barriers related to this technology expansion, employers' preferred ecosystem for support, and the workforce shifts that will be needed to effect those changes. Part II maps three interlocking pillars of the labour market—occupations, skills and tasks—and provides employers with an opportunity to share the jobs that are set

to experience stable, declining and rising demand. Part II also asks employers to estimate the current and future composition of their workforce, and the division of labour between humans, machines and algorithms. Part III gives survey respondents an opportunity to share their current plans for the period up to 2022 as they pertain to closing key skills gaps in their enterprises. In particular, the survey asks employers to rate the likelihood of employing a variety of strategies aimed at ensuring their businesses have the right talent to grow, to give specificity to the scale of their future reskilling needs, and to share a range of detailed information about their current and future reskilling provision.

Representativeness

The survey collection process was conducted via an online questionnaire, with data collection spanning a nine-month period from November 2017 to July 2018. The survey set out to represent the current strategies, projections and estimates of global business, with a focus on large multinational companies and more localized companies which are of significance due to their employee or revenue size. As such there are two areas of the future of jobs that remain out of scope for this report—namely, the future of jobs as it relates to the activities of small and medium-sized enterprises and as it relates to the informal sectors of, in particular, developing economies.

The Future of Jobs Survey was distributed to relevant companies through extensive collaboration between the World Economic Forum and its constituents, amplified by regional survey partners. The survey is also the result of extensive cross-departmental coordination within the World Economic Forum during which the Forum's Business Engagement Team, Centre for Global Industries and Centre for Regional and Geopolitical Affairs supported the report team's efforts to sub-select relevant samples. For key partners in the survey distribution process, please refer to the **Survey Partners** and **Acknowledgements** sections.

Detailed sample design specifications were shared with survey partners, requesting that the sample of companies targeted for participation in the survey should be drawn from a cross-section of leading companies that make up a country or region's economy, and should include—although not necessarily be limited to—national and multinational companies that are among the country's top 100 employers (either by number of employees or by revenue size). In cases where we worked with a regional partner organization we requested additional focus on strong representation from key sectors represented in that geography. To ensure that the survey was representative of the relevant population, the report team conducted additional analysis, confirming the number of responses as well as the size of each respondent's revenue and employee pool.

The final sub-selection of countries with data of sufficient quality to be featured in the report was based on the overall number of responses from companies with a presence in each country—and within that subset, was based on the number of companies headquartered in the relevant location and the diversity of the sample in relation to the companies' number of locations. In particular, the aim was to arrive at a sample in which more than two-fifths of the companies were large multinational firms, and a reasonable range of companies maintained a focused local or regional presence. The final sub-selection of industries included was based on the overall number of responses by industry, in addition to a qualitative review of the pool of named companies represented in the survey data.

After relevant criteria were applied, the sample was found to be composed of 12 industry clusters and 20 economies. Industry clusters include Aviation, Travel & Tourism; Chemistry, Advanced Materials & Biotechnology; Consumer; Energy; Financial Services & Investors; Global Health & Healthcare; Information & Communication Technologies; Infrastructure; Mining & Metals; Mobility; Oil & Gas; and Professional Services. Economies include Argentina, Australia, Brazil, China, France, Germany, India, Indonesia, Japan, Mexico, Philippines, Russian Federation, Singapore, South Africa, Republic of Korea, Switzerland, Thailand, United Kingdom, United States and Vietnam—collectively representing about 70% of global GDP. In total, the report's data set contains 313 unique responses by global companies, collectively representing more than 15 million employees (see Table 1 in Part 1).

Classification Frameworks for Jobs and Skills

Similar to the initial report, this year's report employed the Occupational Information Network (O*NET) framework for its categories of analysis for jobs, skills and tasks. O*NET was developed by the US Department of Labor in collaboration with its Bureau of Labor Statistics' Standard Classification of Occupations (SOC) and remains the most extensive and respected classification of its kind. In its unabridged form, the O*NET-SOC taxonomy includes detailed information on 974 individual occupations in the United States, grouped into approximately 20 broader job families, which are regularly revised and updated for new and emerging occupations to keep up with the changing occupational landscape.

For this edition of the report, the Generalized Work Activities segment of the O*NET methodology was used to form the list of tasks used in the survey. In addition, for the classification of skills, the report team employed an abridged version of the "Worker Characteristics" and Worker Requirement classifications; in particular, bundles 1.A., 1.C., 2.A., and 2.B. Additional details about the composition of the skills list used in this report can be found in Table A1.

Table A1: Classification of skills used, based on O*NET content model

Competency bundle	Competencies, O*NET	Description
Active learning and learning strategies	Active Learning	Understanding the implications of new information for both current and future problem-solving and decision-making.
	Learning Strategies	Selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.
Reading, writing, math, active listening	Active Listening	Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
	Mathematics	Using mathematics to solve problems.
	Reading Comprehension	Understanding written sentences and paragraphs in work related documents.
	Science	Using scientific rules and methods to solve problems.
	Speaking	Talking to others to convey information effectively.
	Writing	Communicating effectively in writing as appropriate for the needs of the audience.
Analyticial thinking and innovation	Analytical Thinking	Job requires analyzing information and using logic to address work-related issues and problems.
	Innovation	Job requires creativity and alternative thinking to develop new ideas for and answers to work-related problems.
Attention to detail, trustworthiness	Attention to Detail	Job requires being careful about detail and thorough in completing work tasks.
	Dependability	Job requires being reliable, responsible, and dependable, and fulfilling obligations.
	Integrity	Job requires being honest and ethical.
Complex problem-solving	Complex Problem-Solving	Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
Coordination and time management	Time Management	Managing one's own time and the time of others.
	Coordination	Adjusting actions in relation to others' actions.
Creativity, originality and initative	Initiative	Job requires a willingness to take on responsibilities and challenges.
	Creativity	Workers on this job try out their own ideas.
	Responsibility	Workers on this job make decisions on their own.
	Autonomy	Workers on this job plan their work with little supervision.
	Originality	The ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.
Critical thinking and analysis	Critical Thinking	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
	Monitoring	Monitoring/assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
Emotional intelligence	Concern for Others	Job requires being sensitive to others' needs and feelings and being understanding and helpful on the job.
	Cooperation	Job requires being pleasant with others on the job and displaying a good-natured, cooperative attitude.
	Social Orientation	Job requires preferring to work with others rather than alone, and being personally connected with others on the job.
	Social Perceptiveness	Being aware of others' reactions and understanding why they react as they do.
Instruction, mentoring and teaching	Instructing	Teaching others how to do something.
	Training and Teaching Others	Identifying the educational needs of others, developing formal educational or training programs or classes, and teaching or instructing others.
Leadership and social influence	Leadership	Job requires a willingness to lead, take charge, and offer opinions and direction.
	Social Influence	Job requires having an impact on others in the organization, and displaying energy and leadership
Management of financial, material resources	Management of Financial Resources	Determining how money will be spent to get the work done, and accounting for these expenditures.
	Management of Material Resources	Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.
Management of personnel	Management of Personnel Resources	Motivating, developing, and directing people as they work, identifying the best people for the job.

(Continued on next page)

Table A1: Classification of skills used, based on O*NET content model *(cont'd.)*

Competency bundle	Competencies, O*NET	Description
Manual dexterity, endurance and precision	Endurance	The ability to exert oneself physically over long periods without getting out of breath.
	Flexibility, Balance, and Coordination	Abilities related to the control of gross body movements.
	Physical Strength Abilities	Abilities related to the capacity to exert force.
	Control Movement Abilities	Abilities related to the control and manipulation of objects in time and space.
	Fine Manipulative Abilities	Abilities related to the manipulation of objects.
	Reaction Time and Speed Abilities	Abilities related to speed of manipulation of objects.
Memory, verbal, auditory and spatial abilities	Attentiveness	Abilities related to application of attention.
	Memory	Abilities related to the recall of available information.
	Perceptual Abilities	Abilities related to the acquisition and organization of visual information.
	Spatial Abilities	Abilities related to the manipulation and organization of spatial information.
	Verbal Abilities	Abilities that influence the acquisition and application of verbal information in problem-solving.
Persuasion and negotiation	Negotiation	Bringing others together and trying to reconcile differences.
	Persuasion	Persuading others to change their minds or behavior.
Quality control and safety awareness	Quality Control Analysis	Conducting tests and inspections of products, services, or processes to evaluate quality or performance.
Reasoning, problem solving and ideation	Idea Generation and Reasoning Abilities	Abilities that influence the application and manipulation of information in problem-solving.
	Quantitative Abilities	Abilities that influence the solution of problems involving mathematical relationships.
Resiliance, stress tolerance and flexibility	Adaptability/Flexibility	Job requires being open to change (positive or negative) and to considerable variety in the workplace.
	Self Control	Job requires maintaining composure, keeping emotions in check, controlling anger, and avoiding aggressive behavior, even in very difficult situations.
	Stress Tolerance	Job requires accepting criticism and dealing calmly and effectively with high stress situations.
Service orientation	Service Orientation	Actively looking for ways to help people.
Systems analysis and evaluation	Judgment and Decision Making	Considering the relative costs and benefits of potential actions to choose the most appropriate one.
	Systems Analysis	Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
	Systems Evaluation	Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.
Technology design and programming	Programming	Writing computer programs for various purposes.
	Technology Design	Generating or adapting equipment and technology to serve user needs.
Technology installation and maintenance	Equipment Maintenance	Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
	Installation	Installing equipment, machines, wiring, or programs to meet specifications.
	Repairing	Repairing machines or systems using the needed tools.
Technology selection, monitoring and control	Equipment Selection	Determining the kind of tools and equipment needed to do a job.
	Operation and Control	Controlling operations of equipment or systems.
	Operation Monitoring	Watching gauges, dials, or other indicators to make sure a machine is working properly.
	Operations Analysis	Analyzing needs and product requirements to create a design.
Troubleshooting and user experience	Troubleshooting	Determining causes of operating errors and deciding what to do about them.
Visual, auditory and speech abilities	Auditory and Speech Abilities	Abilities related to auditory and oral input.
	Visual Abilities	Abilities related to visual sensory input.

Appendix B: Industry and Regional Group Classifications

Table B1: Classification of industries featured in the report

Industry Cluster	Industry
Automotive, Aerospace, Supply Chain and Transport	Automotive
	Aerospace
	Supply Chain and Transport
Aviation, Travel and Tourism	Aviation, Travel and Tourism
Chemistry, Advanced Materials and Biotechnology	Chemistry, Advanced Materials and Biotechnology
Consumer	Retail, Consumer Goods and Lifestyle
	Agriculture, Food and Beverage
Energy Utilities and Technologies	Energy Utilities
	Energy Technologies
Financial Services and Investors	Insurance and Asset Management
	Banking and Capital Markets
	Private Investors
	Institutional Investors
Global Health and Healthcare	Global Health and Healthcare
Information and Communication Technologies	Information Technology
	Telecommunications
	Electronics
Infrastructure	Infrastructure and Urbanisation
Mining and Metals	Mining and Metals
Oil and Gas	Oil and Gas
	Oil Field Services and Equipment
Professional Services	Professional Services

Table B2: Classification of regions, by country elegible for inclusion in the analysis

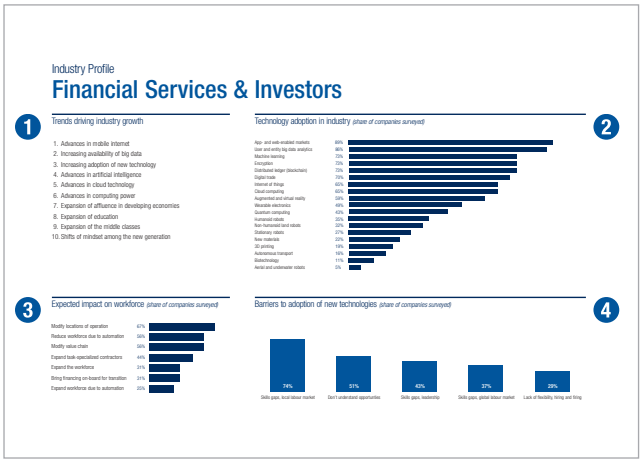
EAST ASIA AND THE PACIFIC	EASTERN EUROPE AND CENTRAL ASIA	LATIN AMERICA AND THE CARIBBEAN	MIDDLE EAST AND NORTH AFRICA	NORTH AMERICA	SOUTH ASIA	SUB-SAHARAN AFRICA	WESTERN EUROPE
Australia	Albania	Argentina	Algeria	Canada	Bangladesh	Angola	Austria
Brunei Darussalam	Armenia	Bahamas	Bahrain	United States	Bhutan	Benin	Belgium
Cambodia	Azerbaijan	Barbados	Egypt		India	Botswana	Cyprus
China	Belarus	Belize	Iran, Islamic Rep.		Maldives	Burkina Faso	Denmark
Fiji	Bosnia and Herzegovina	Bolivia	Iraq		Nepal	Burundi	Finland
Indonesia	Bulgaria	Brazil	Israel		Pakistan	Cameroon	France
Japan	Croatia	Chile	Jordan		Sri Lanka	Cape Verde	Germany
Korea, Rep.	Czech Republic	Colombia	Kuwait			Chad	Greece
Lao PDR	Estonia	Costa Rica	Lebanon			Côte d'Ivoire	Iceland
Malaysia	Georgia	Cuba	Mauritania			Eritrea	Ireland
Mongolia	Hungary	Dominican Republic	Morocco			Ethiopia	Italy
Myanmar	Kazakhstan	Ecuador	Oman			Gabon	Luxembourg
New Zealand	Kyrgyz Republic	El Salvador	Qatar			Gambia, The	Malta
Philippines	Latvia	Guatemala	Saudi Arabia			Ghana	Netherlands
Singapore	Lithuania	Guyana	Syria			Guinea	Norway
Thailand	Macedonia	Haiti	Tunisia			Kenya	Portugal
Timor-Leste	Moldova	Honduras	Turkey			Lesotho	Spain
Vietnam	Montenegro	Jamaica	United Arab Emirates			Liberia	Sweden
	Poland	Mexico	Yemen			Madagascar	Switzerland
	Romania	Nicaragua				Malawi	United Kingdom
	Russian Federation	Panama				Mali	
	Serbia	Paraguay				Mauritius	
	Slovak Republic	Peru				Mozambique	
	Slovenia	Suriname				Namibia	
	Tajikistan	Trinidad and Tobago				Nigeria	
	Ukraine	Uruguay				Rwanda	
	Uzbekistan	Venezuela				Senegal	
						Sierra Leone	
						South Africa	
						Swaziland	
						Tanzania	
						Uganda	
						Zambia	
						Zimbabwe	

Part 2

Industry and Country/Region Profiles

User's Guide: How to Read the Industry and Country/Region Profiles

Part 2 of the report presents findings through an industry and country lens, with the aim of providing specific practical information to decision-makers and experts from academia, business, government and civil society. Complementing the cross-industry and cross-country analysis of results in Part 1, it provides deeper granularity for a given industry, country or region through dedicated Industry Profiles and Country/Region Profiles. Profiles are intended to provide interested companies and policy-makers with the opportunity to benchmark themselves relative to the range of expectations prevalent in their industry and/or country. This User's Guide provides an overview of the information contained in the various Industry Profiles and Country/Region Profiles and its appropriate interpretation.



Industry Profiles

1 Trends driving industry growth

The first section of each Industry Profile provides an overview of the top socio-economic trends and technological disruptions expected to positively affect the growth of the industry over the 2018–2022 period, ranked according to the share of survey respondents from the industry who selected the stated trend as one of the top drivers of growth for their industry. For a more detailed discussion of each trend, please refer to the **Strategic Drivers of New Business Models** section in Part 1 of the report.

2 Technology adoption in industry

The bar chart represents the share of survey respondents from the industry who indicated that, by 2022, their company was "likely" or "very likely" (on a 5-point scale) to have adopted the stated technology as part of its growth strategy. For a more detailed discussion of each technology, please refer to the section **Strategic Drivers of New Business Models** section in Part 1 of the report.

3 Expected impact on workforce

This bar chart represents the share of survey respondents from the industry who expect their company to have adopted the stated measure(s) over the 2018–2022 period as part of their current growth strategy. For a more detailed discussion of each measure, please refer to the **The 2022 Jobs Landscape** section in Part 1 of the report.

4 Barriers to adoption of new technologies

This bar chart represents the five biggest perceived barriers to adopting new technologies across the industry, as measured by the share of survey respondents from the industry who selected the stated obstacle as one of the top

impediments to successful new technology adoption faced by their company. The data featured in the Industry Profile represents additional supplementary information beyond the high-level overview provided in Part 1 of the report.

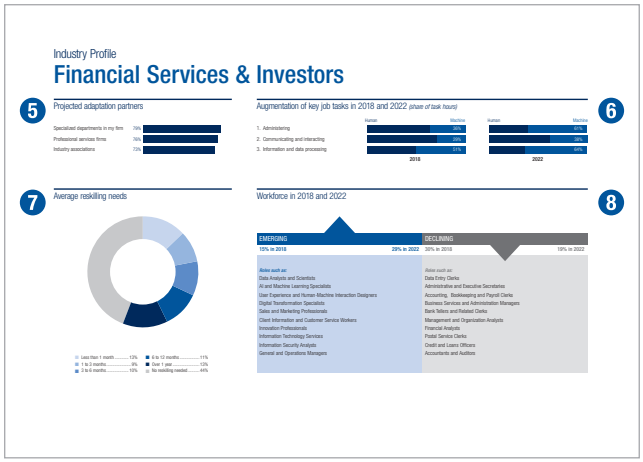
5 Projected adaptation partners

The bar chart in the first section of the second page of the Industry Profile represents the share of survey respondents from the industry who indicated that their company was "likely" or "very likely" (on a 5-point scale) to collaborate with the stated partner entity over the 2018–2022 period to develop measures and strategies for adaptation to the trends and disruptions expected to affect the industry. For a more detailed discussion of adaptation partner collaboration intentions, please refer to the **The Reskilling Imperative** section in Part 1 of the report.

6 Augmentation of key job tasks in 2018 and 2022

Bar charts in this section represent the expected evolution of human-machine collaboration over the 2018–2022 period across the industry. The column labels on the left-hand side of the section report the three most common job tasks, in terms of total task hours, performed across the totality of jobs in the industry. The **2018** column reports the total share of task hours contributed to the achievement of the job task by human workers on the one hand, and by machines or algorithms on the other. For example, if the respective shares were 75% and 25%, respectively, for every hour spent on performing the task in the industry, 45 minutes would have been expended by human workers and 15 minutes by machines or algorithms. The **2022** column reports the expected evolution of this human-machine division of labour across the industry by the stated year.

Note that the diagrams measure the *relative change* in contribution by human workers and machines, not the absolute underlying number of task hours—meaning that there is no "zero-sum" competition between the two. For example, a reduction in the relative share of task hours contributed to a specific task by human workers could be entirely due to increased machine productivity over the 2018–2022 period, rather than a reduction in the absolute number of work hours spent on the task by human workers. For a more detailed discussion of this issue, please refer to the **From Automation to Augmentation** section in Part 1 of the report.



7 Average reskilling needs

This section highlights the expected reskilling needs over the 2018–2022 period across the industry. The diagram represents the distribution of the industry workforce according to the expected average timeframe required to retrain or upskill affected workers—either in order to equip the industry's workforce with the skills needed to seize new opportunities created by the trends and disruptions expected to affect the industry, or in order to avoid losing competitiveness due to the obsolescence of the workforce's existing skillsets. For a more detailed discussion of expected reskilling needs, please refer to the **The Reskilling Imperative** section in Part 1 of the report.

8 Workforce in 2018 and 2022

This table provides an overview of expected developments in the industry-specific job roles most frequently mentioned by survey respondents from the industry. The blue column highlights emerging job roles for the industry in question and indicates their expected total employment share within the industry workforce in 2018 and 2022. Analogously, the grey column highlights declining job roles for the industry in question and indicates their expected total employment share within the industry workforce in 2018 and 2022. The individual job roles listed underneath each category are for illustrative purposes and report the job roles most frequently cited by survey respondents from the industry. Categorization of job roles is adapted from the O*NET labour market information system (please see **Appendix A: Report Methodology** for details).

Country/Region Profiles

1 Factors determining job location decisions

The first section of each Country/Region Profile provides an overview of the factors determining job location decisions at a global level for companies operating in the country or region. On the one hand, policy-makers may use the information provided to benchmark the country on the priority factors identified by each industry to determine opportunities for the country to build up its future talent pool in a targeted manner. On the other hand, the information provided might also prove useful to evaluate the potential risk posed by new technologies and shifting comparative advantage that might affect future company and industry location decisions in relation to the country. For a more detailed discussion of this issue, please refer to the **The Future of Jobs across Regions** section in Part 1 of the report.

2 Technology adoption

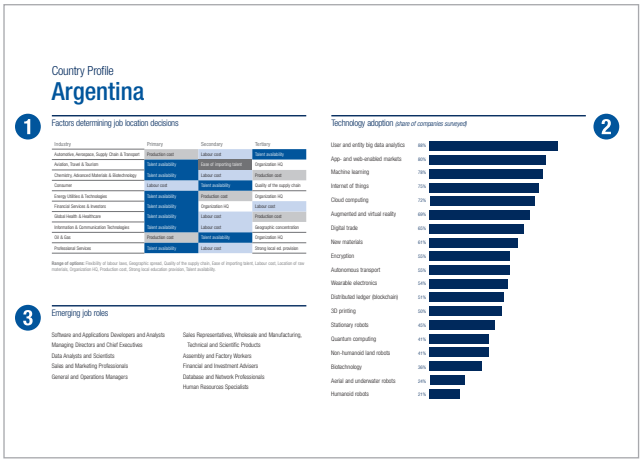
This bar chart represents the share of survey respondents from companies operating in the country in question who indicated that, by 2022, their company was "likely" or "very likely" (on a 5-point scale) to have adopted the stated technology as part of its growth strategy. For a more detailed discussion of each technology, please refer to the **Strategic Drivers of New Business Models** section in Part 1 of the report.

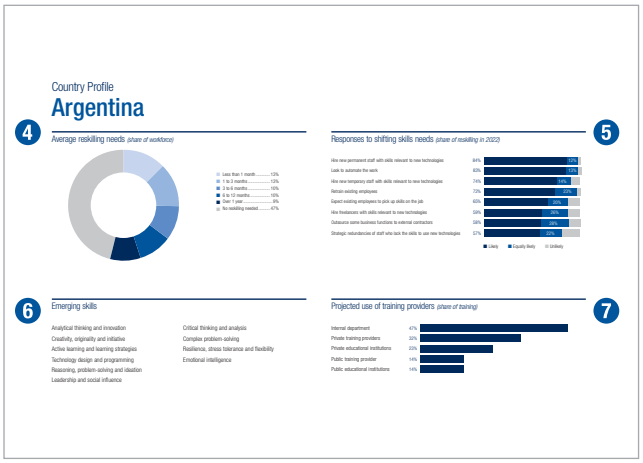
3 Emerging job roles

This table provides an overview of job roles expected to experience an increase in demand across the country over the 2018–2022 period. The individual job roles listed are for illustrative purposes and report the job roles most frequently cited by survey respondents from companies operating in the country. Categorization of job roles is adapted from the O*NET labour market information system (please see **Appendix A: Report Methodology** for details).

4 Average reskilling needs

The first section of the second page of the Country/Region Profile highlights the expected reskilling needs over the 2018–2022 period across the country. The diagram represents the distribution of the country's workforce according to the expected average timeframe required to retrain or upskill affected workers—either in order to equip the country's workforce with the skills needed to seize new opportunities created by the trends and disruptions expected to affect businesses operating in the country in question, or in order to avoid losing competitiveness due to the obsolescence of the workforce's existing skillsets. For a more detailed discussion of expected reskilling needs,





please refer to the **The Reskilling Imperative** section in Part 1 of the report.

5 Responses to shifting skills needs

This stacked bar chart is a diagrammatic representation of the share of survey respondents from companies operating in the country in question who indicated that, by 2022, their company was either "likely" or "very likely" (on a 5-point scale) to have implemented the stated response measure to shifting skills needs within its industry, that their company was yet "undecided" about introducing the response measure in question, or who questioned the need for introducing the stated response measure and therefore indicated that their company was "unlikely" or "very unlikely" (on a 5-point scale) to adopt it. The stacked bars are ordered by the overall proportion of survey respondents from companies operating in the country who considered introduction of the respective response measures "likely" or "very likely"—providing a sense of the total shifting skills needs response profile across companies operating in the country. Underlying responses have been rounded and may therefore not exactly add up to 100%. For a more detailed discussion of expected

reskilling response strategies, please refer to the **The Reskilling Imperative** section in Part 1 of the report.

6 Emerging skills

This table provides an outlook on the expected evolution of workforce skills demand over the 2018–2022 period across the country. The individual skills listed are for illustrative purposes and report the skills most frequently cited by survey respondents from companies operating in the country. Categorization of skills is adapted from the O*NET labour market information system. For a detailed description of each skill, please see Table A1 in the **Appendix A: Report Methodology** section in v of the report.

7 Projected use of training providers

This bar chart represents the share of survey respondents from companies operating in the country who expect their company to make use of the stated education and training provider(s) over the 2018–2022 period to deliver reskilling and upskilling opportunities to their current workforce. For a more detailed discussion of companies' retraining and upskilling intentions, please refer to **The Reskilling Imperative** section in Part 1 of the report.

Index of Profiles

Industry Profiles

Automotive, Aerospace, Supply Chain & Transport 42
Aviation, Travel & Tourism 44
Chemistry, Advanced Materials & Biotechnology 46
Consumer 48
Energy Utilities & Technologies 50
Financial Services & Investors 52
Global Health & Healthcare 54
Information & Communication Technologies 56
Infrastructure 58
Mining & Metals 60
Oil & Gas 62
Professional Services 64

Country/Region Profiles

Argentina 68
Australia 70
Brazil 72
China 74
France 76
Germany 78
India 80
Indonesia 82
Japan 84
Korea, Rep. 86
Mexico 88
Philippines 90
Russian Federation 92
Singapore 94
South Africa 96
Switzerland 98
Thailand 100
United Kingdom 102
United States 104
Vietnam 106
Central Asia 108
East Asia and the Pacific 110
Eastern Europe 112
Latin America and the Caribbean 114
Middle East and North Africa 116
North America 118
South Asia 120
Sub-Saharan Africa 122
Western Europe 124

Industry Profiles

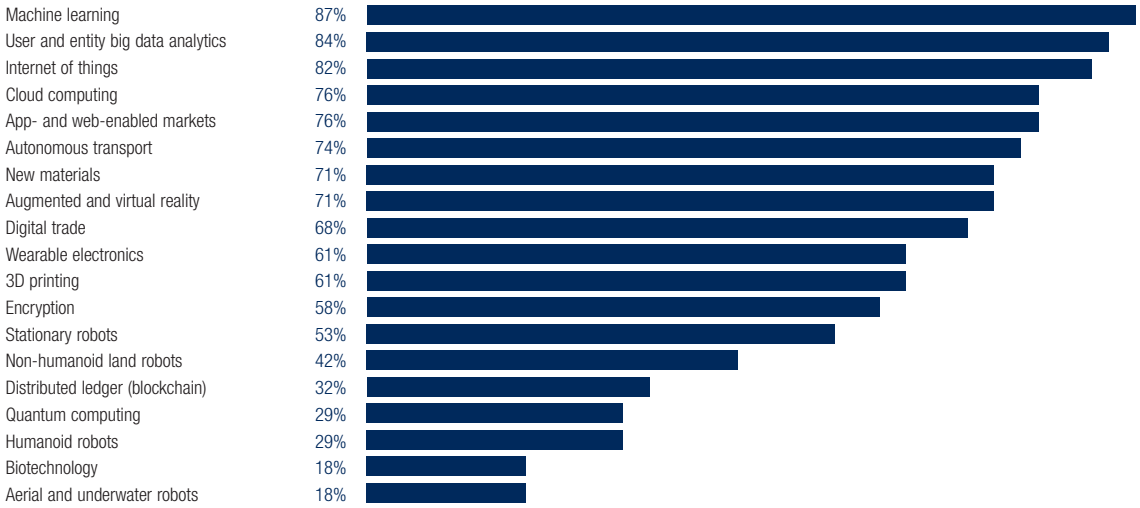
Industry Profile

Automotive, Aerospace, Supply Chain & Transport

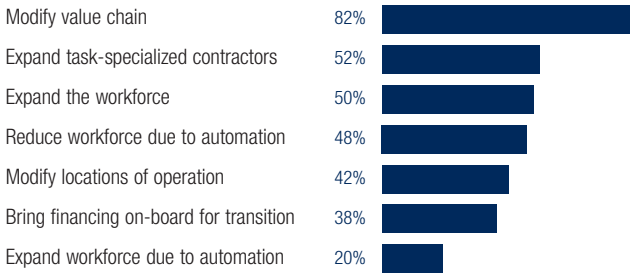
Trends driving industry growth

1. Increasing adoption of new technology
2. Advances in artificial intelligence
3. Increasing availability of big data
4. Shifts in national economic growth
5. Advances in new energy supplies and technologies
6. Advances in mobile internet
7. Advances in cloud technology
8. Expansion of affluence in developing economies
9. Advances in computing power
10. Advances in devices bridging the human-machine divide

Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*

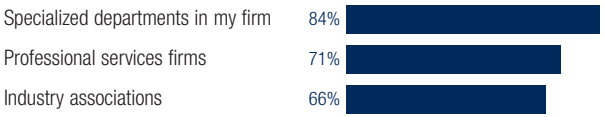


Barriers to adoption of new technologies *(share of companies surveyed)*

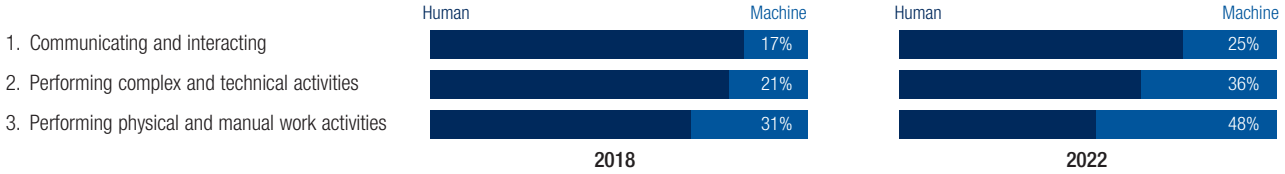
Industry Profile

Automotive, Aerospace, Supply Chain & Transport

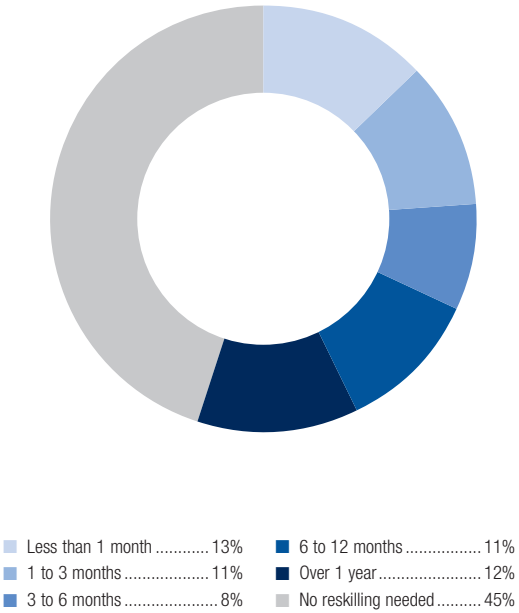
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING

8% in 2018 → **21% in 2022**

Roles such as:

Data Analysts and Scientists
AI and Machine Learning Specialists
Process Automation Specialists
Software and Applications Developers and Analysts
Innovation Professionals
Sales and Marketing Professionals
Service and Solutions Designers
Product Managers
Industrial and Production Engineers
Supply Chain and Logistics Specialists

DECLINING

41% in 2018 → **26% in 2022**

Roles such as:

Assembly and Factory Workers
Data Entry Clerks
Client Information and Customer Service Workers
Accountants and Auditors
Accounting, Bookkeeping and Payroll Clerks
Administrative and Executive Secretaries
Transportation Attendants and Conductors
Material-Recording and Stock-Keeping Clerks
General and Operations Managers
Business Services and Administration Managers

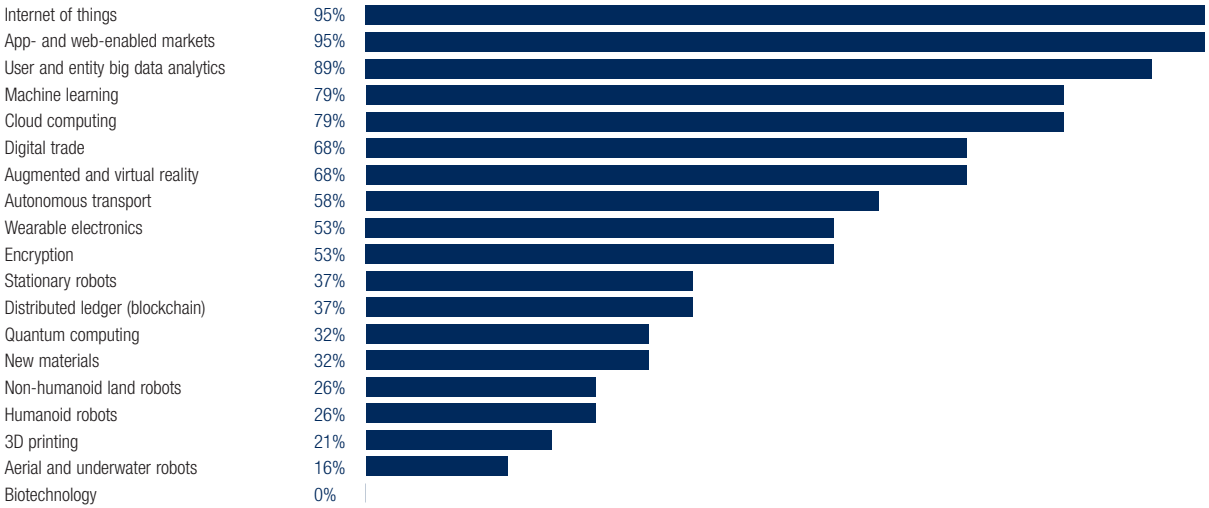
Industry Profile

Aviation, Travel & Tourism

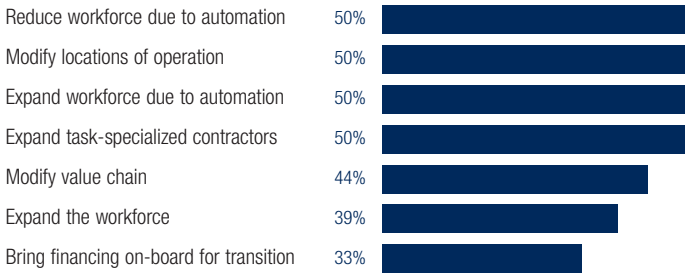
Trends driving industry growth

1. Advances in mobile internet
2. Increasing adoption of new technology
3. Expansion of affluence in developing economies
4. Advances in artificial intelligence
5. Expansion of the middle classes
6. Expansion of education
7. Increasing availability of big data
8. Increasing frequency of new working arrangements
9. Shifts in national economic growth
10. Advances in cloud technology

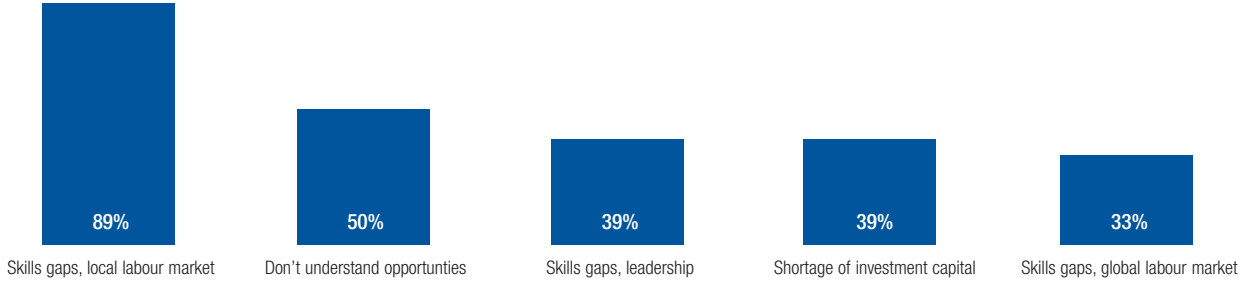
Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*



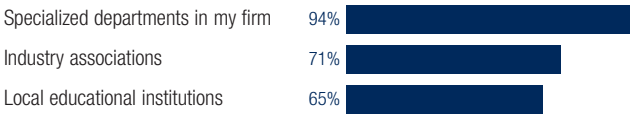
Barriers to adoption of new technologies *(share of companies surveyed)*



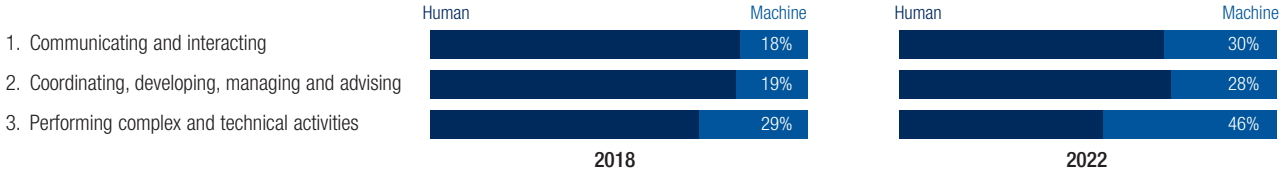
Industry Profile

Aviation, Travel & Tourism

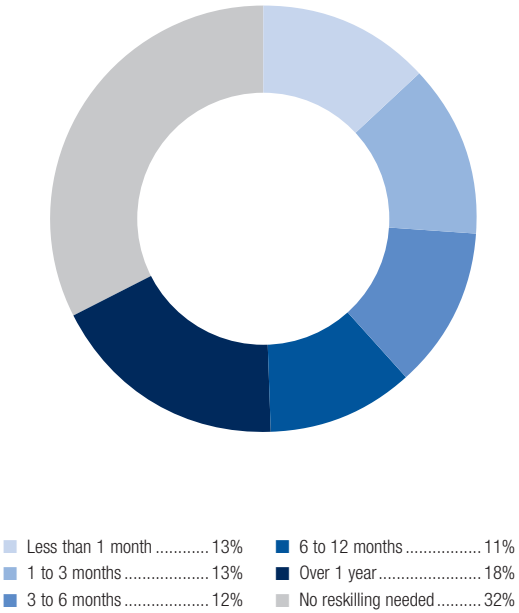
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING		DECLINING	
8% in 2018	13% in 2022	25% in 2018	14% in 2022
Roles such as:		*Roles such as:*	
General and Operations Managers		Accounting, Bookkeeping and Payroll Clerks	
Data Analysts and Scientists		Data Entry Clerks	
User Experience and Human-Machine Interaction Designers		Administrative and Executive Secretaries	
AI and Machine Learning Specialists		Concierges and Hotel Desk Clerks	
Software and Applications Developers		Accountants and Auditors	
Sales and Marketing Professionals		Sales and Purchasing Agents and Brokers	
Product Managers		Material-Recording and Stock-Keeping Clerks	
Innovation Professionals		Financial Analysts	
Information Security Analysts		Client Information and Customer Service Workers	
Brand and Communication Specialists		Cashiers and Ticket Clerks	

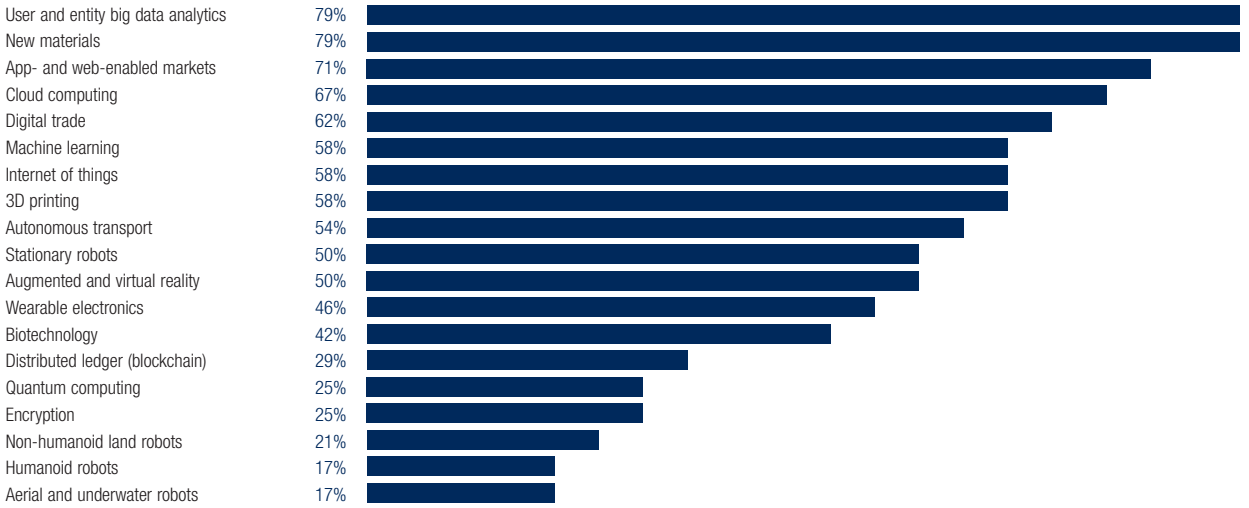
Industry Profile

Chemistry, Advanced Materials & Biotechnology

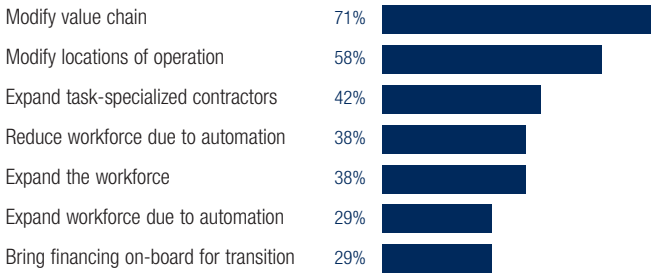
Trends driving industry growth

1. Increasing adoption of new technology
2. Expansion of affluence in developing economies
3. Increasing availability of big data
4. Advances in new energy supplies and technologies
5. Shifts in global macroeconomic growth
6. Shifts in national economic growth
7. Advances in artificial intelligence
8. Advances in computing power
9. Expansion of the middle classes
10. Increasing urbanization

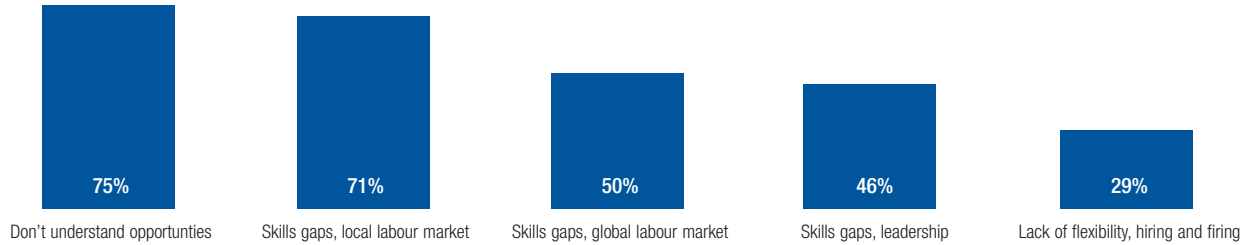
Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*



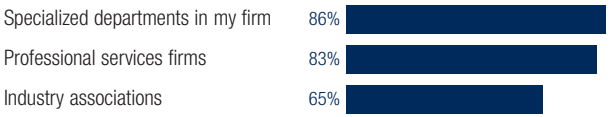
Barriers to adoption of new technologies *(share of companies surveyed)*



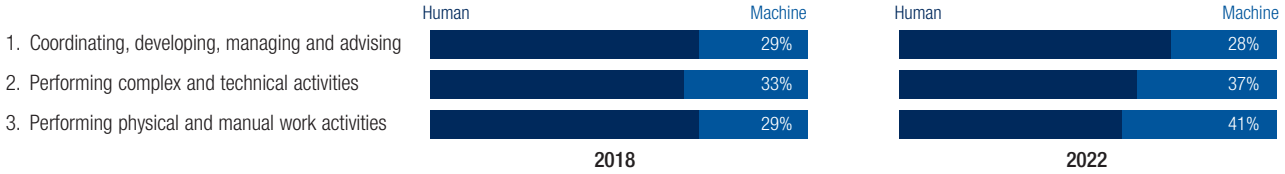
Industry Profile

Chemistry, Advanced Materials & Biotechnology

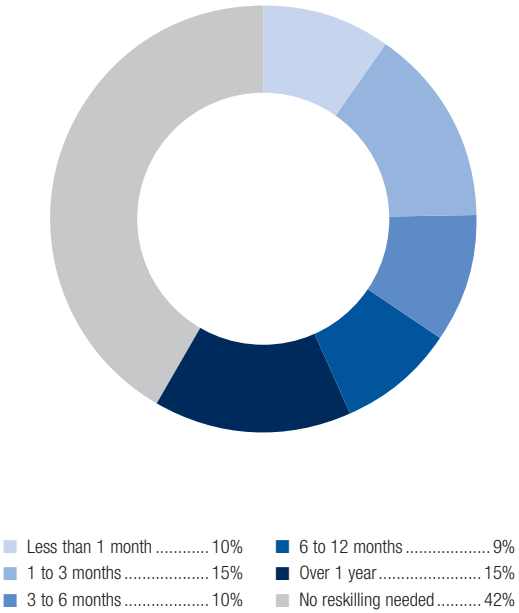
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING

10% in 2018 → 19% in 2022

Roles such as:

- General and Operations Managers
- AI and Machine Learning Specialists
- Sales and Marketing Professionals
- Organisational Development Specialists
- Mechanical Engineers
- Data Analysts and Scientists
- Research and Development Officers
- New Technology Specialists
- Innovation Professionals

DECLINING

25% in 2018 → 19% in 2022

Roles such as:

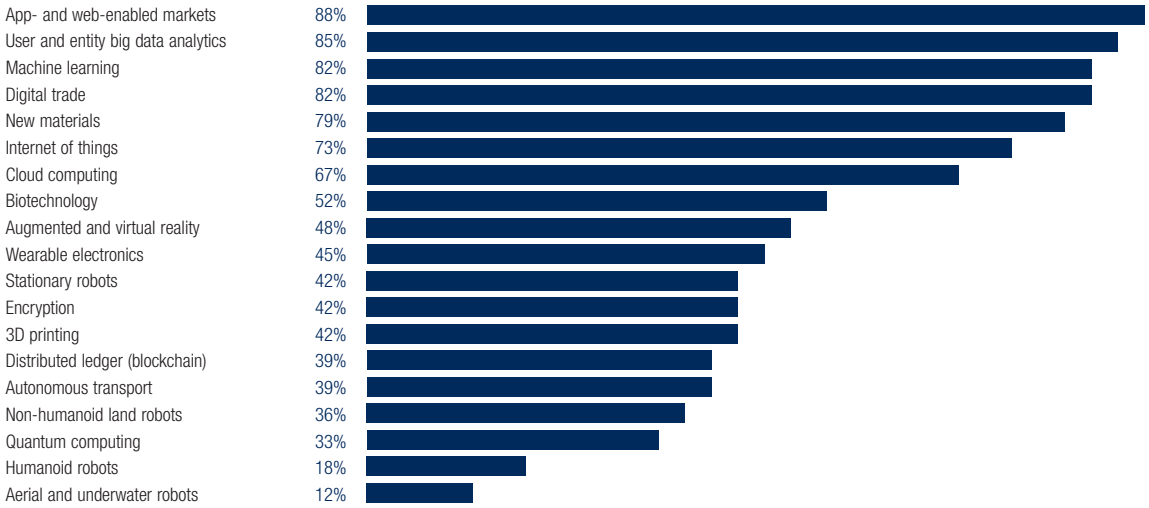
- Data Entry Clerks
- Assembly and Factory Workers
- Accounting, Bookkeeping and Payroll Clerks
- Cashiers and Ticket Clerks
- Administrative and Executive Secretaries
- Building Caretakers and Housekeepers
- Sales and Purchasing Agents and Brokers
- Financial and Investment Advisers
- Special Education Teachers

Industry Profile
Consumer

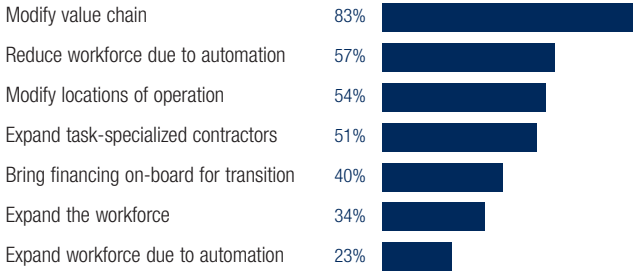
Trends driving industry growth

1. Advances in mobile internet
2. Advances in artificial intelligence
3. Shifts of mindset among the new generation
4. Increasing adoption of new technology
5. Increasing availability of big data
6. Increasing urbanization
7. Shifts in national economic growth
8. Advances in new energy supplies and technologies
9. Expansion of affluence in developing economies
10. Expansion of the middle classes

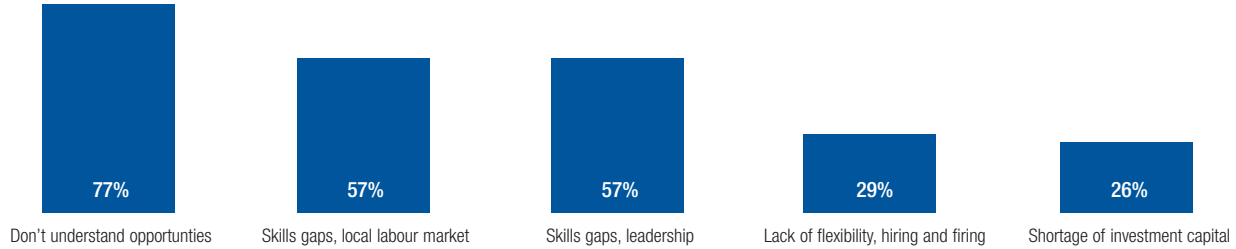
Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*



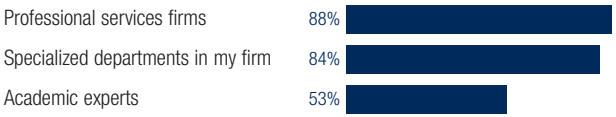
Barriers to adoption of new technologies *(share of companies surveyed)*



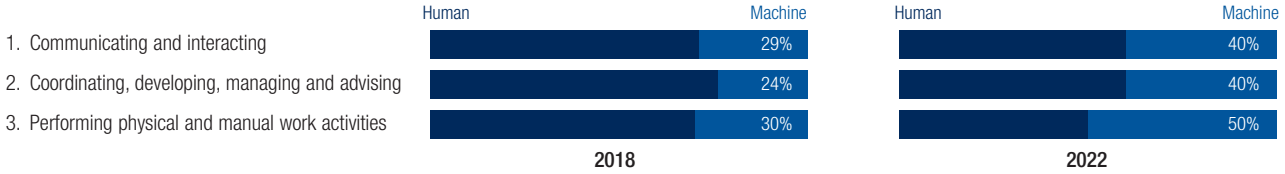
Industry Profile

Consumer

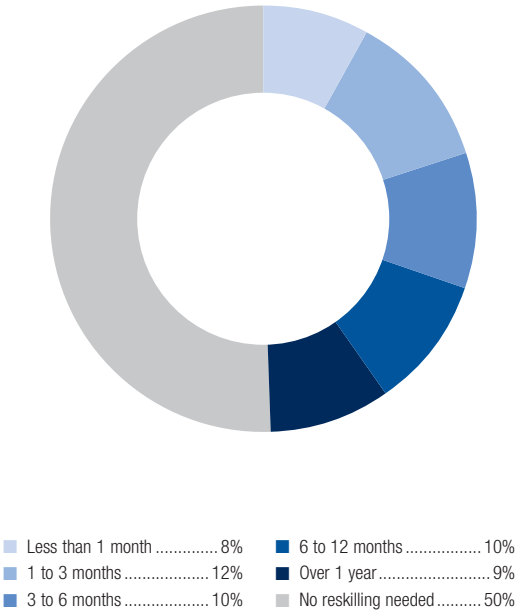
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING

15% in 2018 → **28% in 2022**

Roles such as:

Data Analysts and Scientists
Sales and Marketing Professionals
AI and Machine Learning Specialists
Training and Development Specialists
General and Operations Managers
Ecommerce and Social Media Specialists
Organisational Development Specialists
New Technology Specialists
Information Technology Services
User Experience and Human-Machine Interaction Designers

DECLINING

31% in 2018 → **22% in 2022**

Roles such as:

Data Entry Clerks
Accounting, Bookkeeping and Payroll Clerks
Assembly and Factory Workers
Administrative and Executive Secretaries
Material-Recording and Stock-Keeping Clerks
Cashiers and Ticket Clerks
Postal Service Clerks
Garment and Related Trades Workers
Business Services and Administration Managers
Social Media Strategist

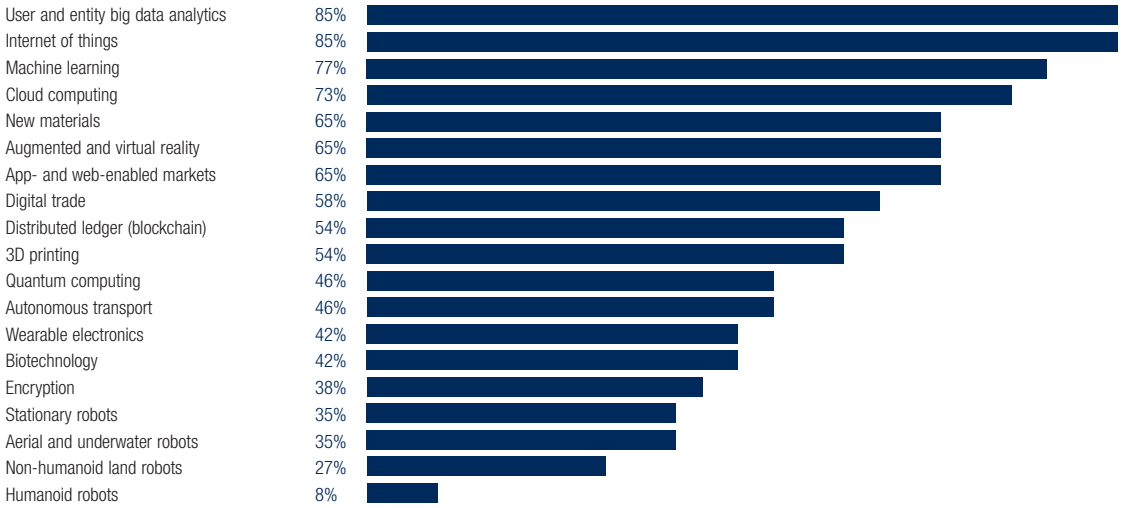
Industry Profile

Energy Utilities & Technologies

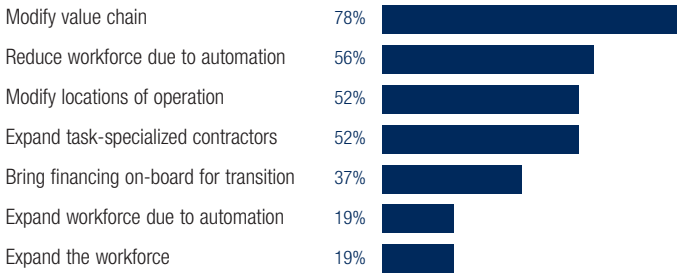
Trends driving industry growth

1. Advances in new energy supplies and technologies
2. Increasing availability of big data
3. Advances in artificial intelligence
4. Advances in cloud technology
5. Advances in computing power
6. Increasing adoption of new technology
7. Expansion of education
8. Advances in mobile internet
9. Effects of climate change
10. Expansion of affluence in developing economies

Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*

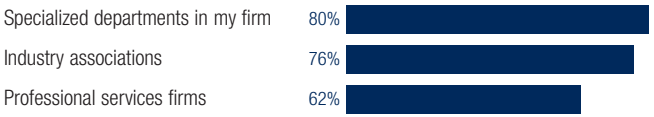


Barriers to adoption of new technologies *(share of companies surveyed)*

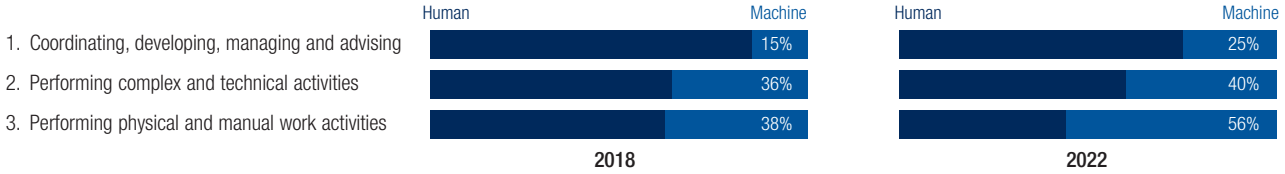
Industry Profile

Energy Utilities & Technologies

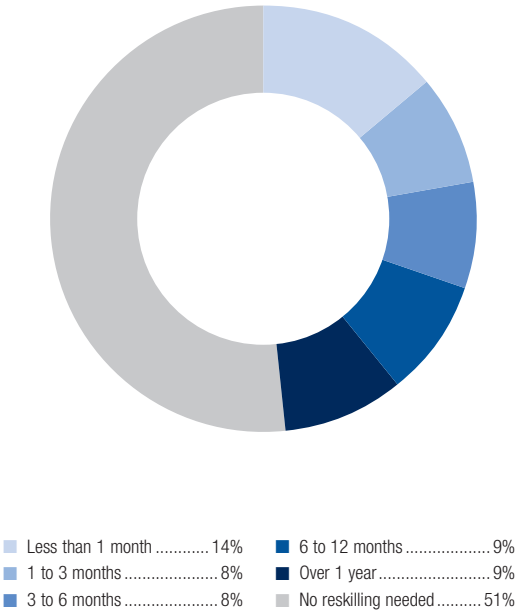
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING

16% in 2018 → **31% in 2022**

Roles such as:

Data Analysts and Scientists
Organisational Development Specialists
Renewable Energy Engineers
Digital Transformation Specialists
Big Data Specialists
Software and Applications Developers and Analysts
Process Automation Specialists
AI and Machine Learning Specialists
New Technology Specialists
Innovation Professionals

DECLINING

34% in 2018 → **24% in 2022**

Roles such as:

Data Entry Clerks
Mechanics and Machinery Repairers
Accounting, Bookkeeping and Payroll Clerks
Human Resources Specialists
Administrative and Executive Secretaries
Power Production Plant Operators
Petroleum and Natural Gas Refining Plant Operators
Material-Recording and Stock-Keeping Clerks
Assembly and Factory Workers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products

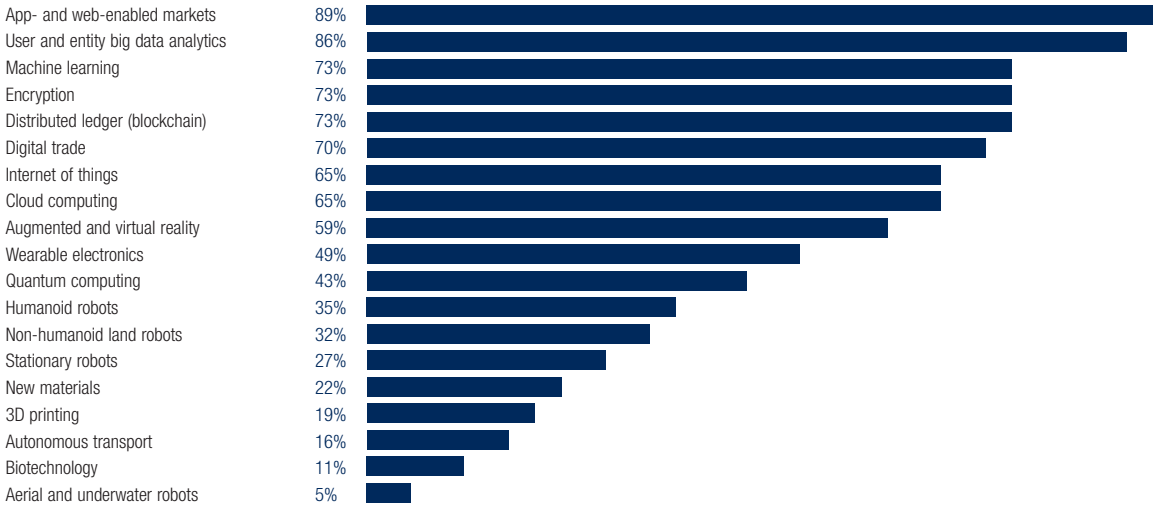
Industry Profile

Financial Services & Investors

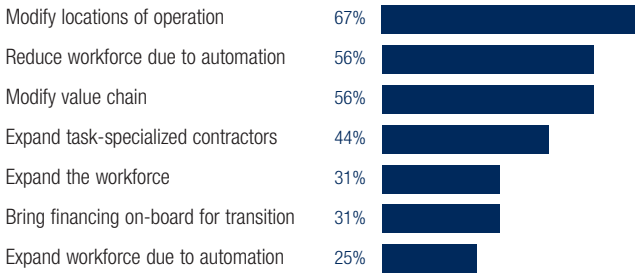
Trends driving industry growth

1. Advances in mobile internet
2. Increasing availability of big data
3. Increasing adoption of new technology
4. Advances in artificial intelligence
5. Advances in cloud technology
6. Advances in computing power
7. Expansion of affluence in developing economies
8. Expansion of education
9. Expansion of the middle classes
10. Shifts of mindset among the new generation

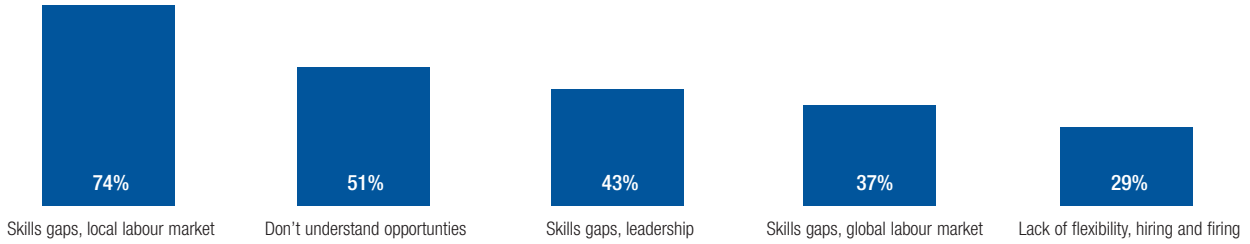
Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*



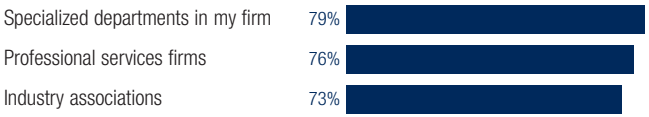
Barriers to adoption of new technologies *(share of companies surveyed)*



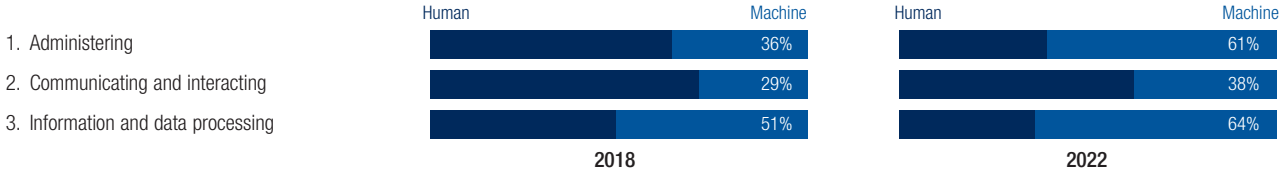
Industry Profile

Financial Services & Investors

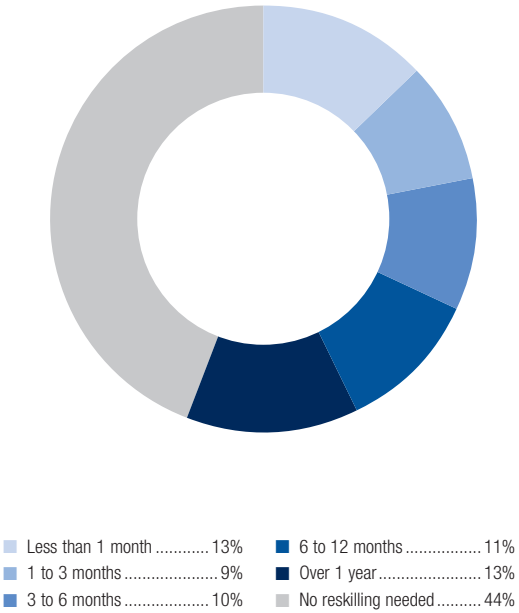
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING	DECLINING
15% in 2018 — 29% in 2022	30% in 2018 — 19% in 2022
Roles such as:	***Roles such as:***
Data Analysts and Scientists	Data Entry Clerks
AI and Machine Learning Specialists	Administrative and Executive Secretaries
User Experience and Human-Machine Interaction Designers	Accounting, Bookkeeping and Payroll Clerks
Digital Transformation Specialists	Business Services and Administration Managers
Sales and Marketing Professionals	Bank Tellers and Related Clerks
Client Information and Customer Service Workers	Management and Organization Analysts
Innovation Professionals	Financial Analysts
Information Technology Services	Postal Service Clerks
Information Security Analysts	Credit and Loans Officers
General and Operations Managers	Accountants and Auditors

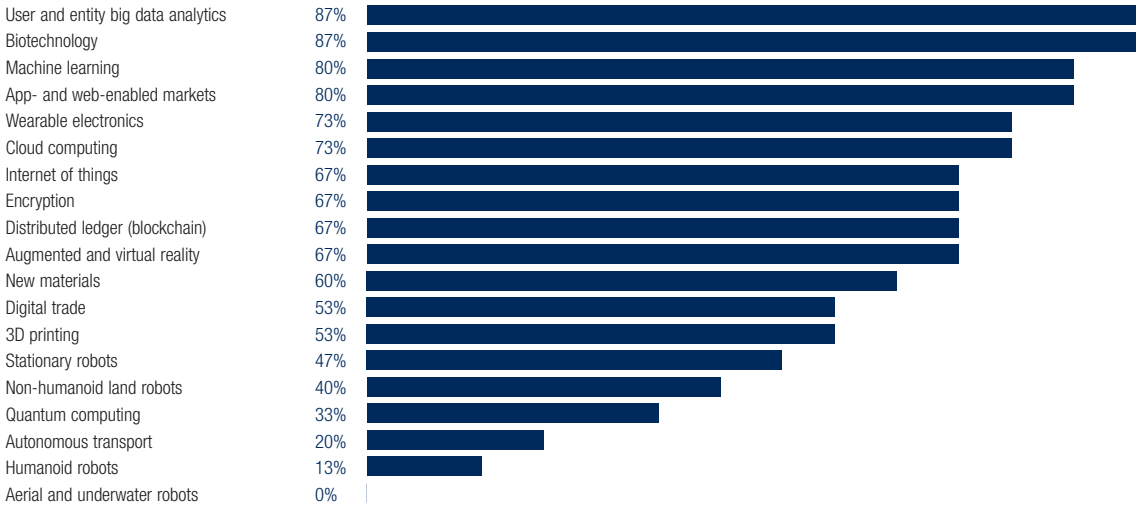
Industry Profile

Global Health & Healthcare

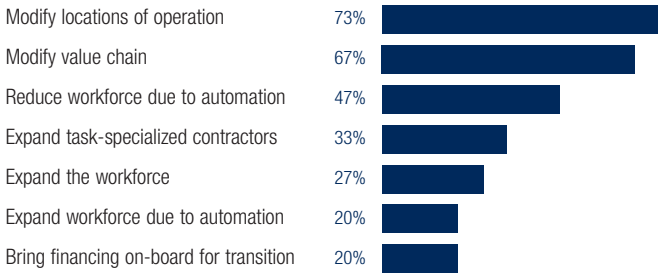
Trends driving industry growth

1. Increasingly ageing societies
2. Advances in artificial intelligence
3. Expansion of affluence in developing economies
4. Expansion of the middle classes
5. Increasing adoption of new technology
6. Increasing availability of big data
7. Shifts in global macroeconomic growth
8. Shifts in national economic growth
9. Advances in mobile internet
10. Expansion of education

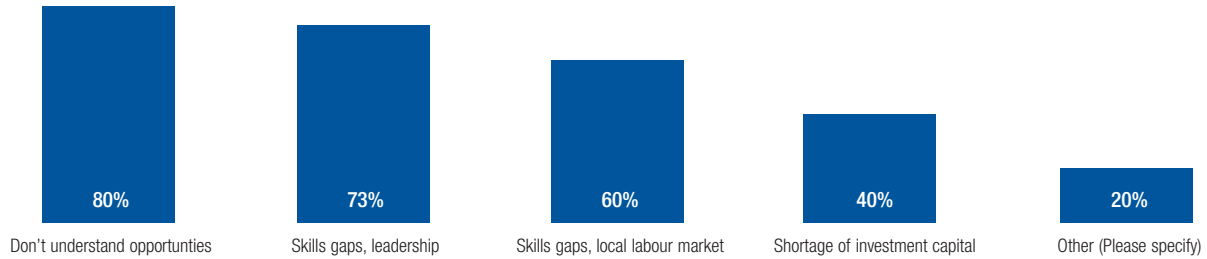
Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*



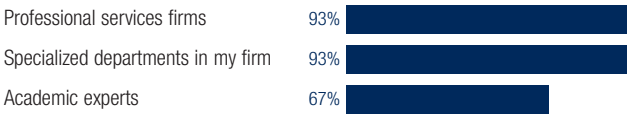
Barriers to adoption of new technologies *(share of companies surveyed)*



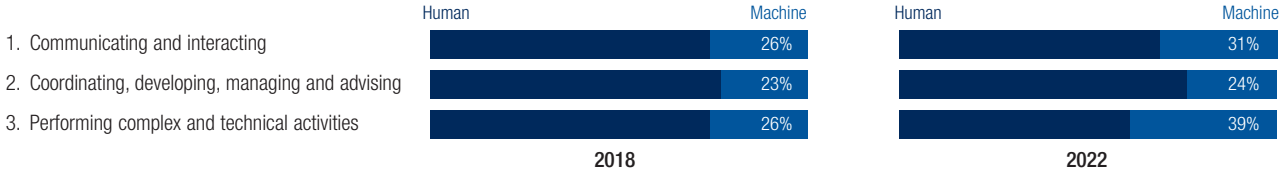
Industry Profile

Global Health & Healthcare

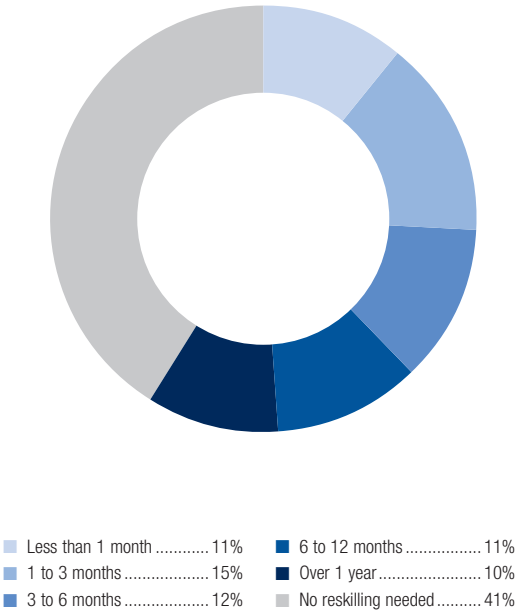
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING	DECLINING
8% in 2018 — 17% in 2022	33% in 2018 — 21% in 2022
Roles such as:	***Roles such as:***
Data Analysts and Scientists	Data Entry Clerks
Biologists and Geneticists	Assembly and Factory Workers
AI and Machine Learning Specialists	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Information Technology Services	Postal Service Clerks
Environmental and Occupational Health and Hygiene Professionals	Electronics and Telecommunications Installers and Repairers
Big Data Specialists	Client Information and Customer Service Workers
Administrative and Executive Secretaries	Business Services and Administration Managers
Supply Chain and Logistics Specialists	Accounting, Bookkeeping and Payroll Clerks
Specialist Medical Practitioners	Accountants and Auditors
	Traditional and Complementary Medicine Professionals

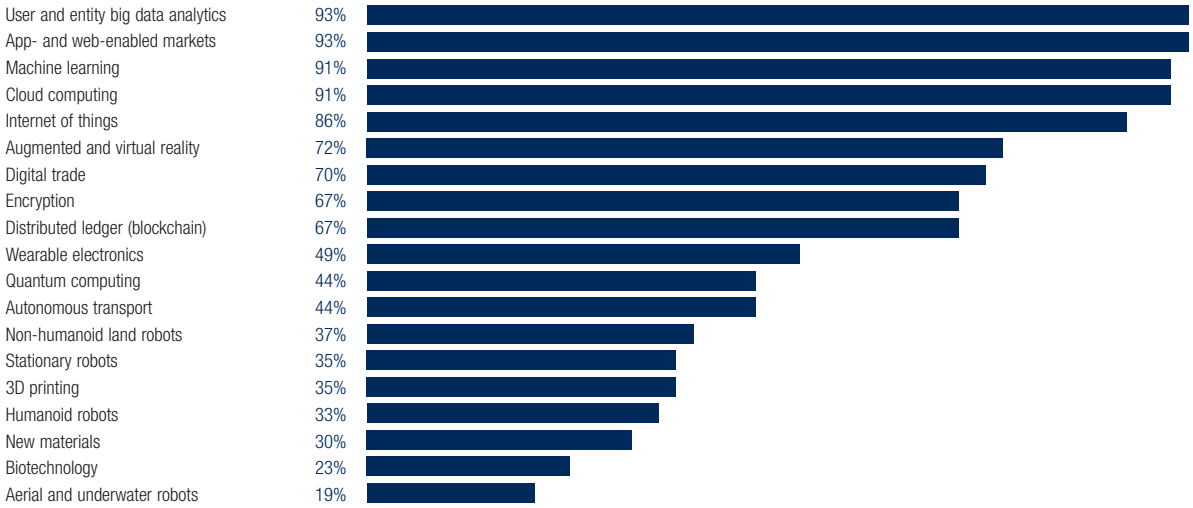
Industry Profile

Information & Communication Technologies

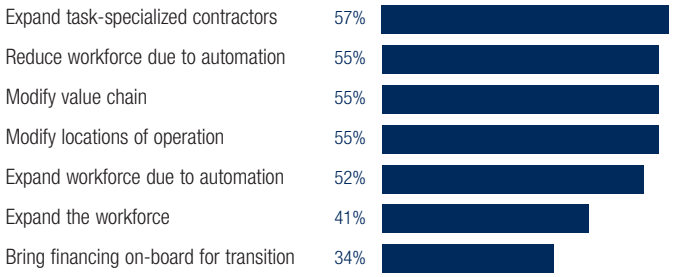
Trends driving industry growth

1. Increasing adoption of new technology
2. Advances in cloud technology
3. Increasing availability of big data
4. Advances in mobile internet
5. Advances in computing power
6. Advances in artificial intelligence
7. Advances in devices bridging the human-machine divide
8. Expansion of affluence in developing economies
9. Expansion of education
10. Advances in new energy supplies and technologies

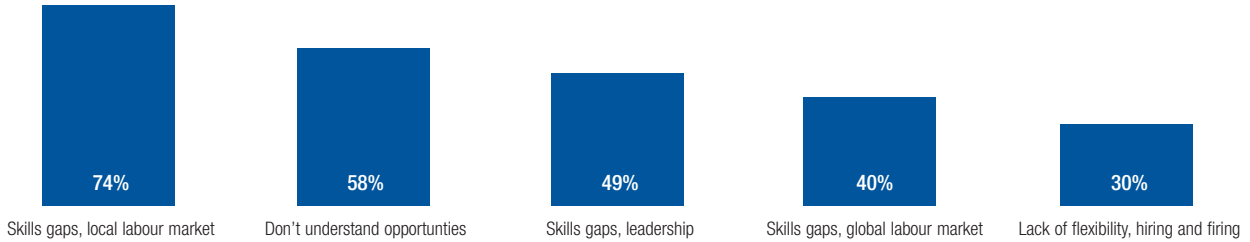
Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*



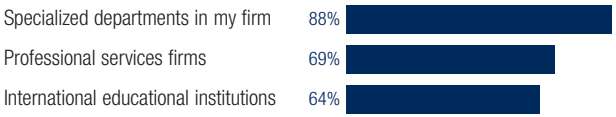
Barriers to adoption of new technologies *(share of companies surveyed)*



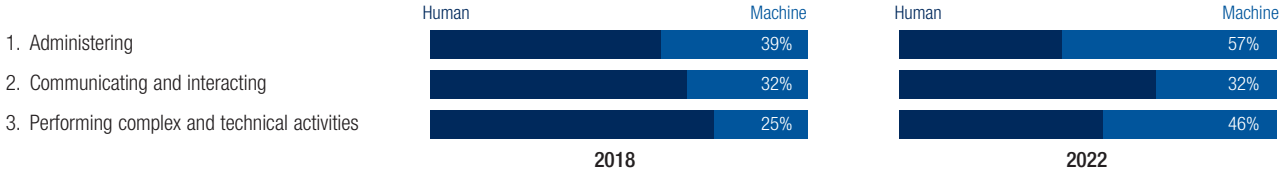
Industry Profile

Information & Communication Technologies

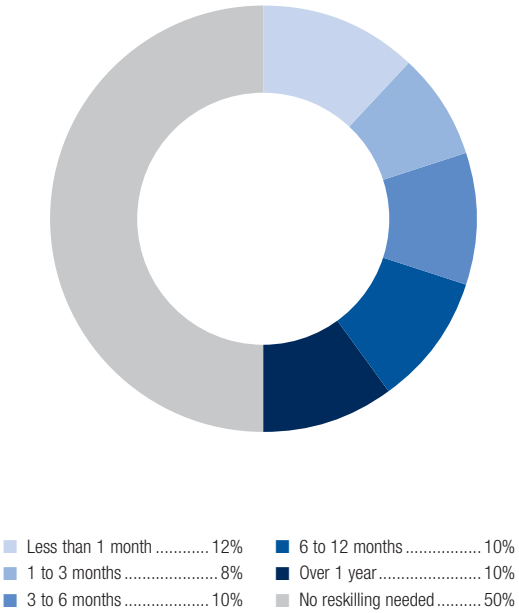
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING	DECLINING
17% in 2018 → 33% in 2022	34% in 2018 → 24% in 2022
Roles such as:	***Roles such as:***
Data Analysts and Scientists	Data Entry Clerks
AI and Machine Learning Specialists	Administrative and Executive Secretaries
Big Data Specialists	ICT Operations and User Support Technicians
Software and Applications Developers and Analysts	Accounting, Bookkeeping and Payroll Clerks
Innovation Professionals	Client Information and Customer Service Workers
Information Security Analysts	Business Services and Administration Managers
New Technology Specialists	Assembly and Factory Workers
Blockchain Specialists	Material-Recording and Stock-Keeping Clerks
User Experience and Human-Machine Interaction Designers	Human Resources Specialists
Sales and Marketing Professionals	Electronics and Telecommunications Installers and Repairers

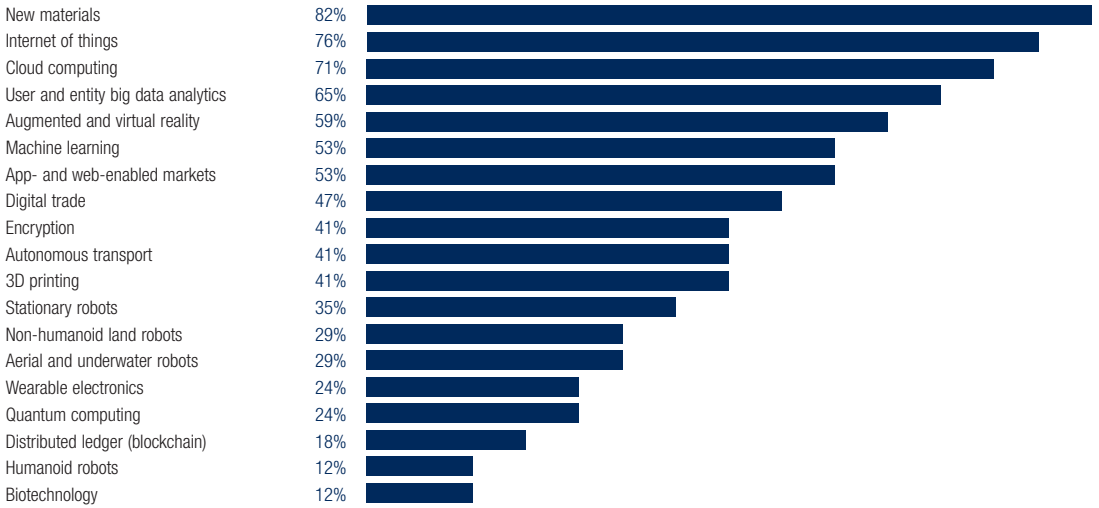
Industry Profile

Infrastructure

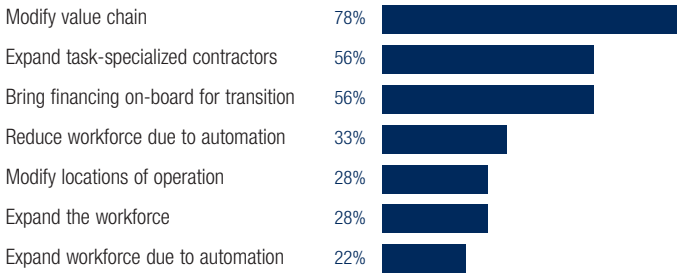
Trends driving industry growth

1. Increasing urbanization
2. Increasing availability of big data
3. Advances in new energy supplies and technologies
4. Expansion of the middle classes
5. Shifts in national economic growth
6. Advances in artificial intelligence
7. Expansion of affluence in developing economies
8. Advances in cloud technology
9. Shifts in global macroeconomic growth
10. Advances in devices bridging the human-machine divide

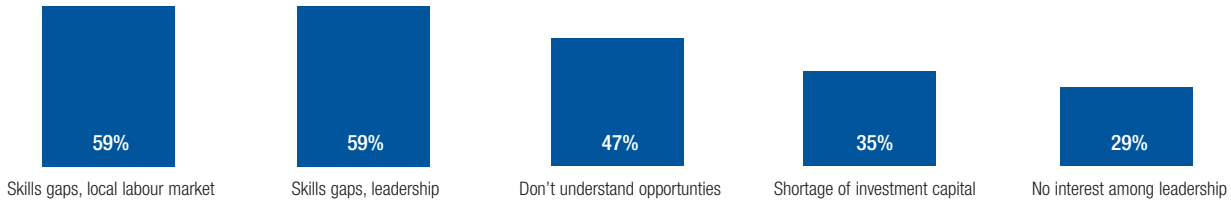
Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*



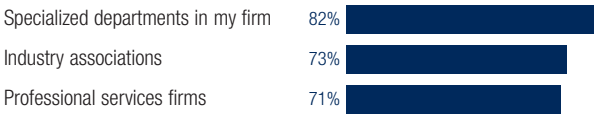
Barriers to adoption of new technologies *(share of companies surveyed)*



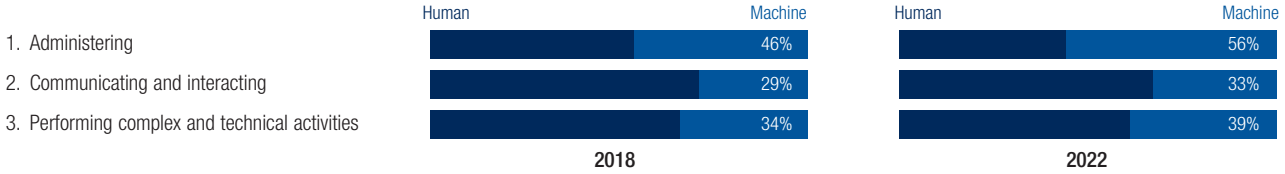
Industry Profile

Infrastructure

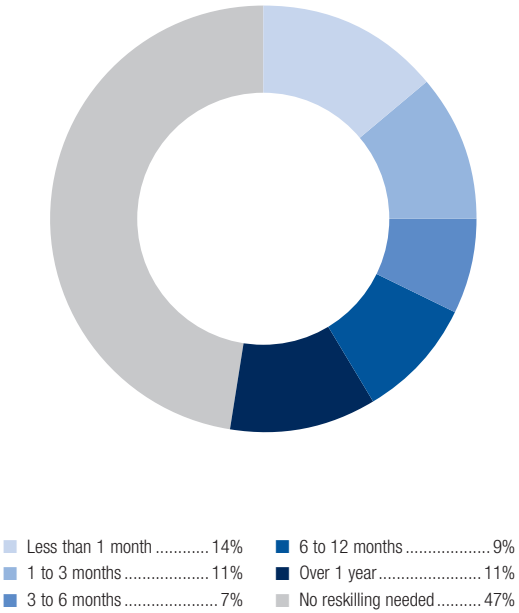
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING	DECLINING
16% in 2018 — 19% in 2022	38% in 2018 — 30% in 2022
Roles such as:	***Roles such as:***
Robotics Specialists and Engineers	Data Entry Clerks
Data Analysts and Scientists	Assembly and Factory Workers
Software and Applications Developers and Analysts	Administrative and Executive Secretaries
Sales and Marketing Professionals	Accounting, Bookkeeping and Payroll Clerks
Product Managers	Mechanics and Machinery Repairers
Organisational Development Specialists	General and Operations Managers
Information Security Analysts	Electronics and Telecommunications Installers and Repairers
Big Data Specialists	Credit and Loans Officers
Process Automation Specialists	Client Information and Customer Service Workers
User Experience and Human-Machine Interaction Designers	Civil Engineers

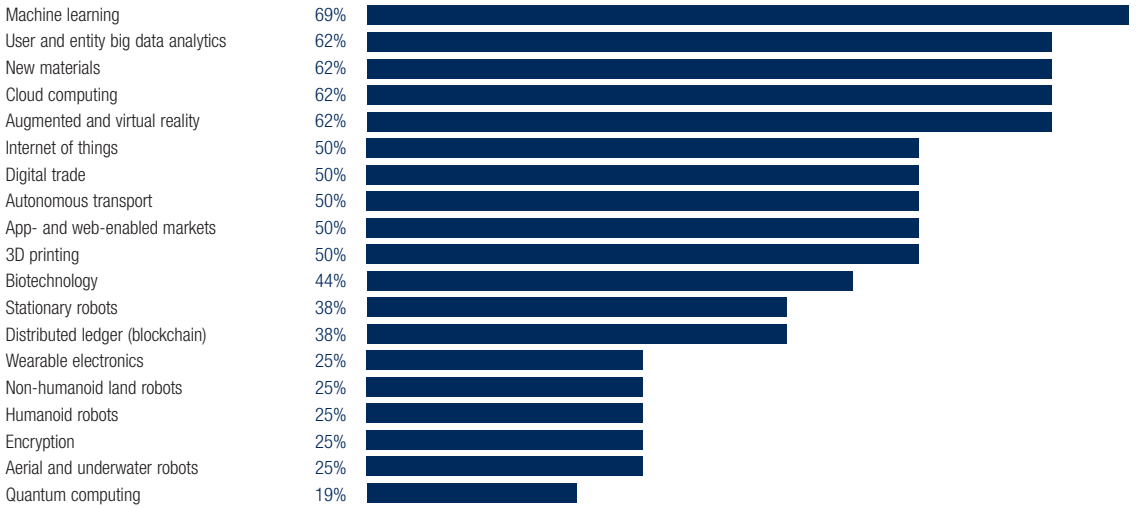
Industry Profile

Mining & Metals

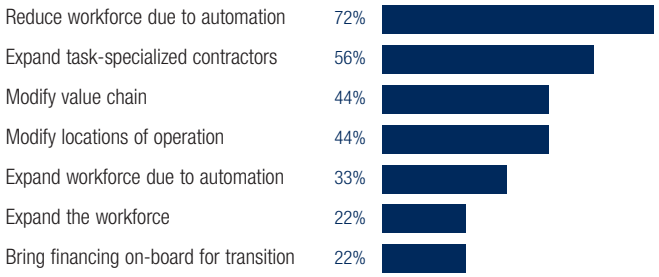
Trends driving industry growth

1. Increasing adoption of new technology
2. Advances in devices bridging the human-machine divide
3. Advances in new energy supplies and technologies
4. Advances in artificial intelligence
5. Shifts in national economic growth
6. Expansion of education
7. Expansion of gender parity
8. Increasing availability of big data
9. Shifts in global macroeconomic growth
10. Advances in cloud technology

Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*

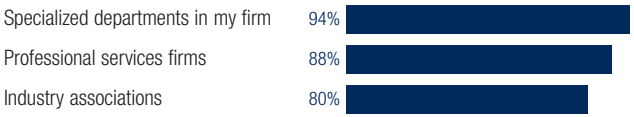


Barriers to adoption of new technologies *(share of companies surveyed)*

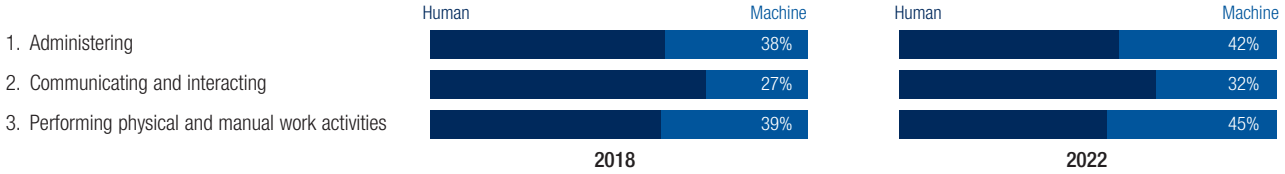
Industry Profile

Mining & Metals

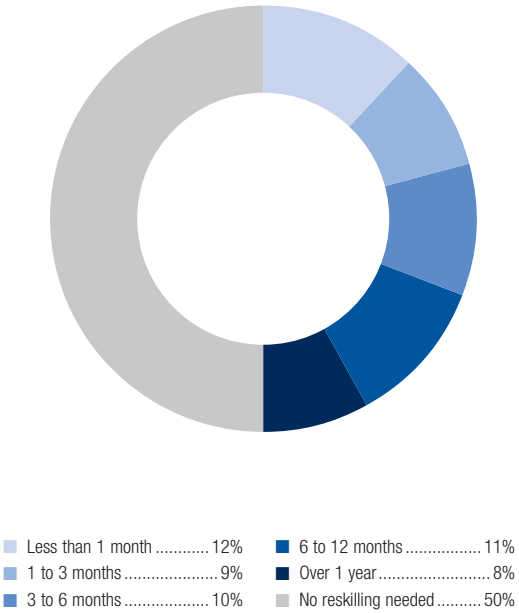
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING		DECLINING	
15% in 2018	22% in 2022	40% in 2018	32% in 2022
Roles such as:		***Roles such as:***	
Sales and Marketing Professionals		Mining and Petroleum Plant Operators	
New Technology Specialists		Accounting, Bookkeeping and Payroll Clerks	
General and Operations Managers		Mining and Petroleum Extraction Workers	
Data Analysts and Scientists		Business Services and Administration Managers	
Process Automation Specialists		Mechanics and Machinery Repairers	
Organisational Development Specialists		Management and Organization Analysts	
Big Data Specialists		Locomotive Engine Drivers and Related Workers	
AI and Machine Learning Specialists		Heavy Truck and Bus Drivers	
Systems Engineers		Data Analysts and Scientists	
Supply Chain and Logistics Specialists		Assembly and Factory Workers	

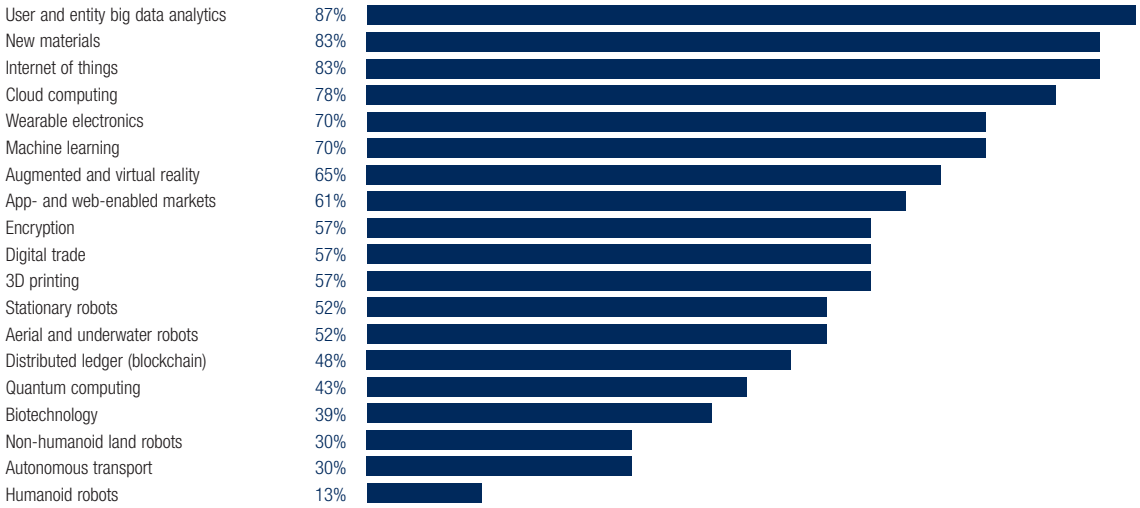
Industry Profile

Oil & Gas

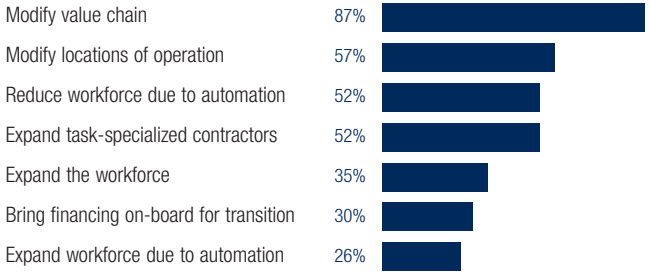
Trends driving industry growth

1. Advances in cloud technology
2. Advances in computing power
3. Increasing availability of big data
4. Increasing adoption of new technology
5. Advances in artificial intelligence
6. Advances in new energy supplies and technologies
7. Shifts in national economic growth
8. Advances in mobile internet
9. Expansion of education
10. Expansion of gender parity

Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*

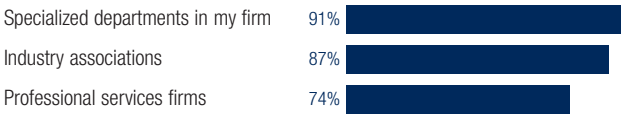


Barriers to adoption of new technologies *(share of companies surveyed)*

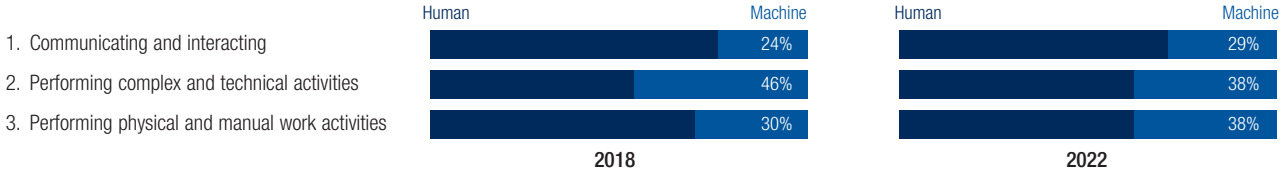
Industry Profile

Oil & Gas

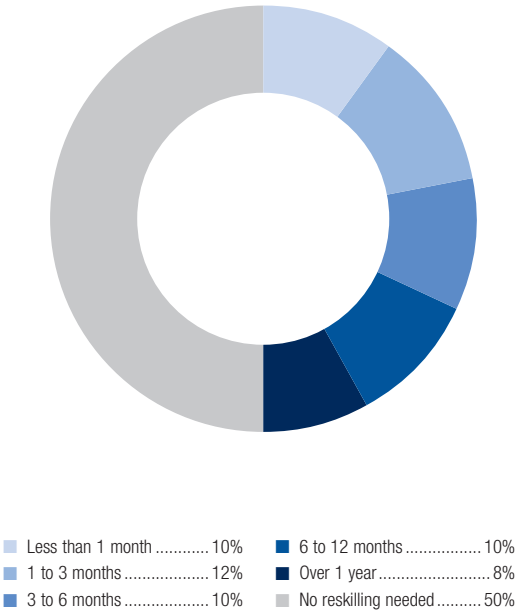
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING

17% in 2018 → **26% in 2022**

Roles such as:

Data Analysts and Scientists
Big Data Specialists
Robotics Specialists and Engineers
Renewable Energy Engineers
Process Automation Specialists
Organisational Development Specialists
New Technology Specialists
Information Technology Services
Digital Transformation Specialists
Scrum Masters

DECLINING

27% in 2018 → 24% in 2022

Roles such as:

Data Entry Clerks
Accounting, Bookkeeping and Payroll Clerks
Petroleum and Natural Gas Refining Plant Operators
Mechanics and Machinery Repairers
Material-Recording and Stock-Keeping Clerks
Administrative and Executive Secretaries
Power Production Plant Operators
Mining and Petroleum Plant Operators
Printing and Related Trades Workers
ICT Operations and User Support Technicians

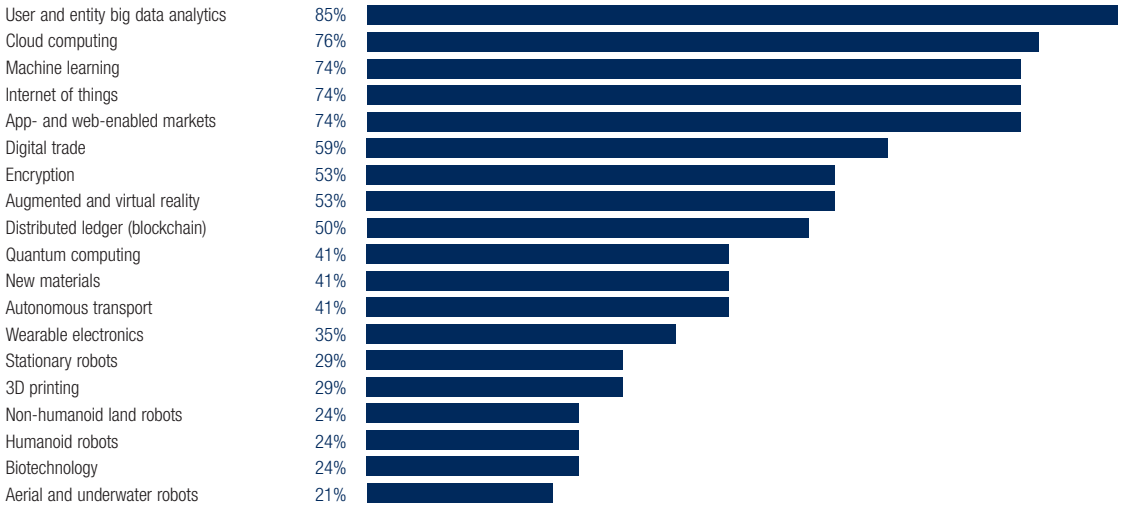
Industry Profile

Professional Services

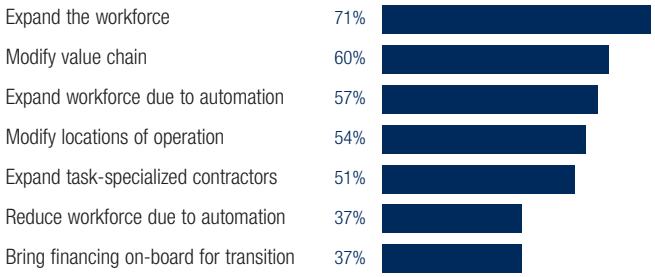
Trends driving industry growth

1. Increasing adoption of new technology
2. Advances in artificial intelligence
3. Increasing availability of big data
4. Advances in cloud technology
5. Advances in mobile internet
6. Expansion of education
7. Shifts in national economic growth
8. Expansion of affluence in developing economies
9. Increasing frequency of new working arrangements
10. Shifts of mindset among the new generation

Technology adoption in industry *(share of companies surveyed)*



Expected impact on workforce *(share of companies surveyed)*

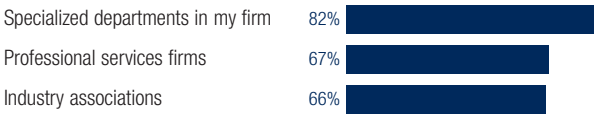


Barriers to adoption of new technologies *(share of companies surveyed)*

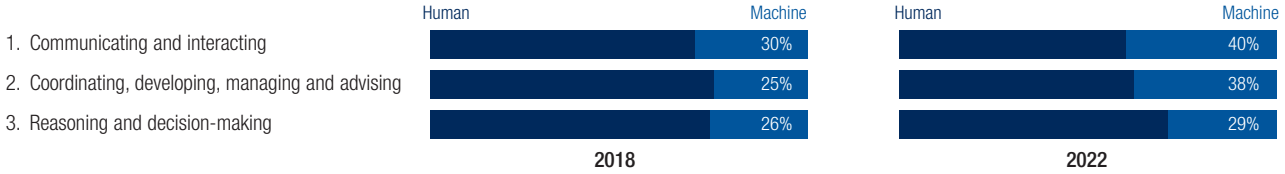
Industry Profile

Professional Services

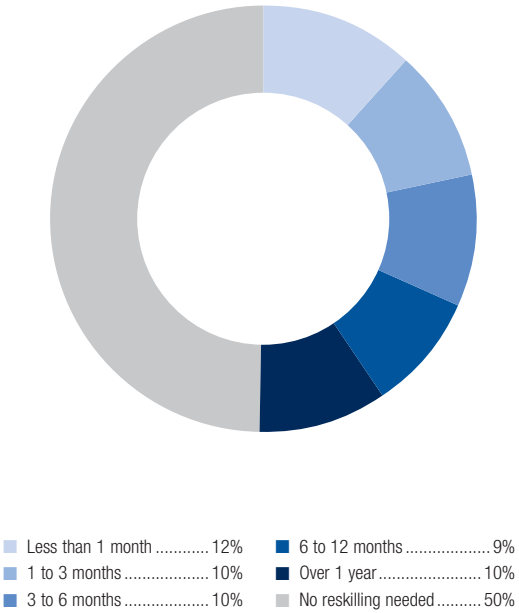
Projected adaptation partners



Augmentation of key job tasks in 2018 and 2022 *(share of task hours)*



Average reskilling needs *(share of workforce)*



Workforce in 2018 and 2022

EMERGING

17% in 2018 → **37% in 2022**

Roles such as:

Digital Transformation Specialists
Regulatory and Government Associate Professionals
Organisational Development Specialists
Data Analysts and Scientists
Contract-Workforce Managers
Training and Development Specialists
Process Automation Specialists
Innovation Professionals
Information Technology Services

DECLINING

36% in 2018 → **18% in 2022**

Roles such as:

Accounting, Bookkeeping and Payroll Clerks
Data Entry Clerks
Administrative and Executive Secretaries
Material-Recording and Stock-Keeping Clerks
Client Information and Customer Service Workers
Accountants and Auditors
Telemarketers
Postal Service Clerks
Car, Van and Motorcycle Drivers

Country and Region Profiles

Country Profile
Argentina

Factors determining job location decisions

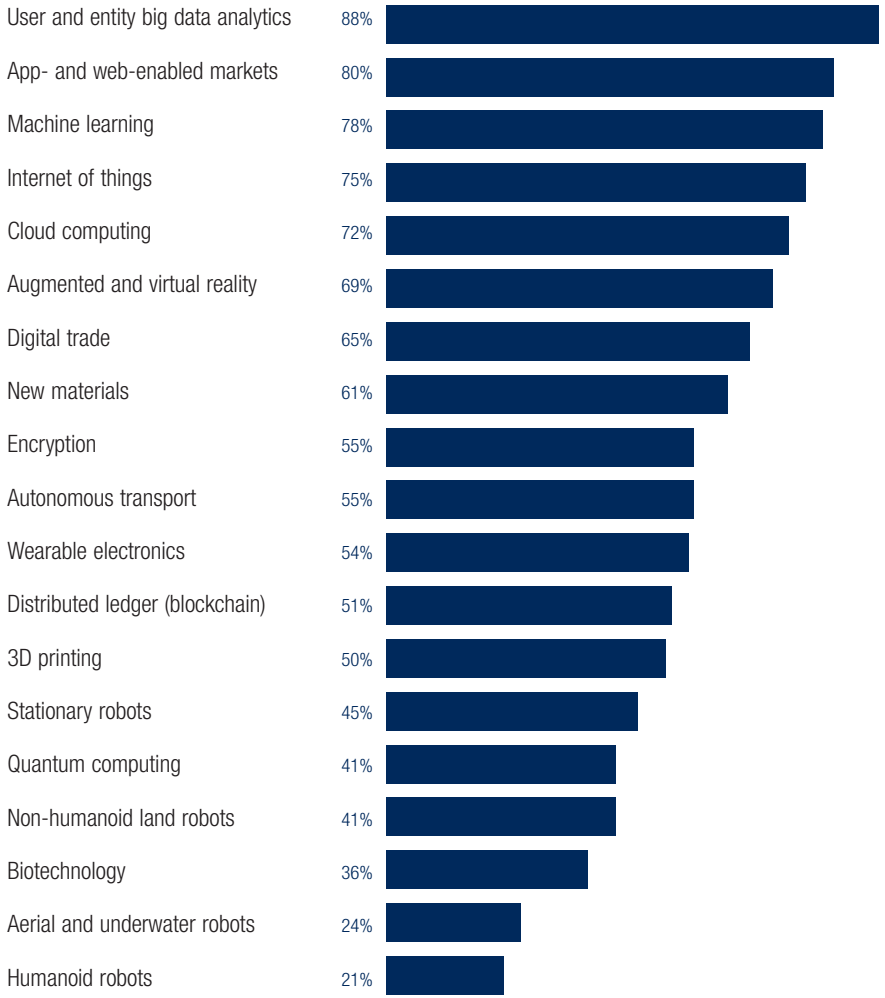
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Production cost	Labour cost	Talent availability
Aviation, Travel & Tourism	Talent availability	Ease of importing talent	Organization HQ
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Talent availability	Production cost	Organization HQ
Financial Services & Investors	Talent availability	Organization HQ	Labour cost
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Production cost	Talent availability	Organization HQ
Professional Services	Talent availability	Labour cost	Strong local ed. provision

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Data Analysts and Scientists
Sales and Marketing Professionals
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Assembly and Factory Workers
Financial and Investment Advisers
Database and Network Professionals
Human Resources Specialists

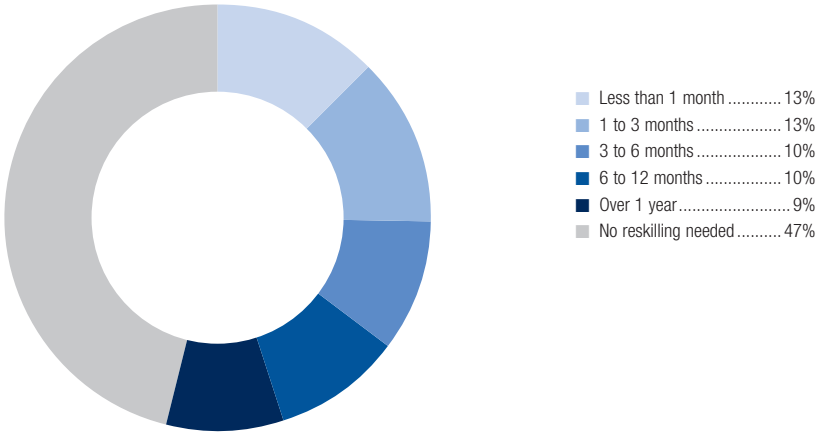
Technology adoption *(share of companies surveyed)*



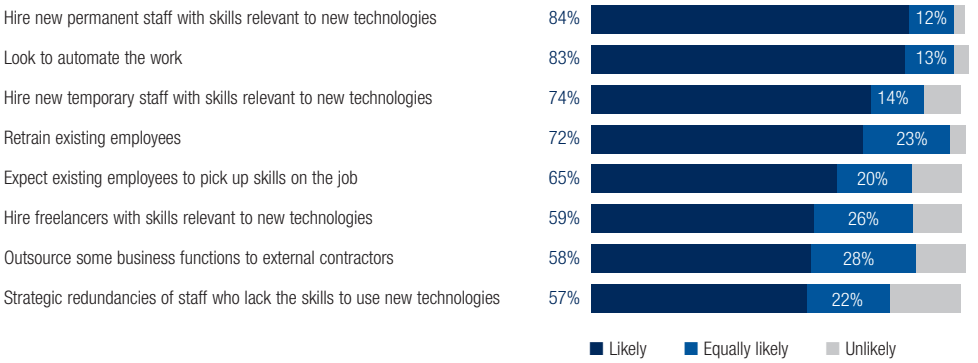
Country Profile

Argentina

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Reasoning, problem-solving and ideation
Leadership and social influence
Critical thinking and analysis
Complex problem-solving
Resilience, stress tolerance and flexibility
Emotional intelligence

Projected use of training providers *(share of training)*

Country Profile
Australia

Factors determining job location decisions

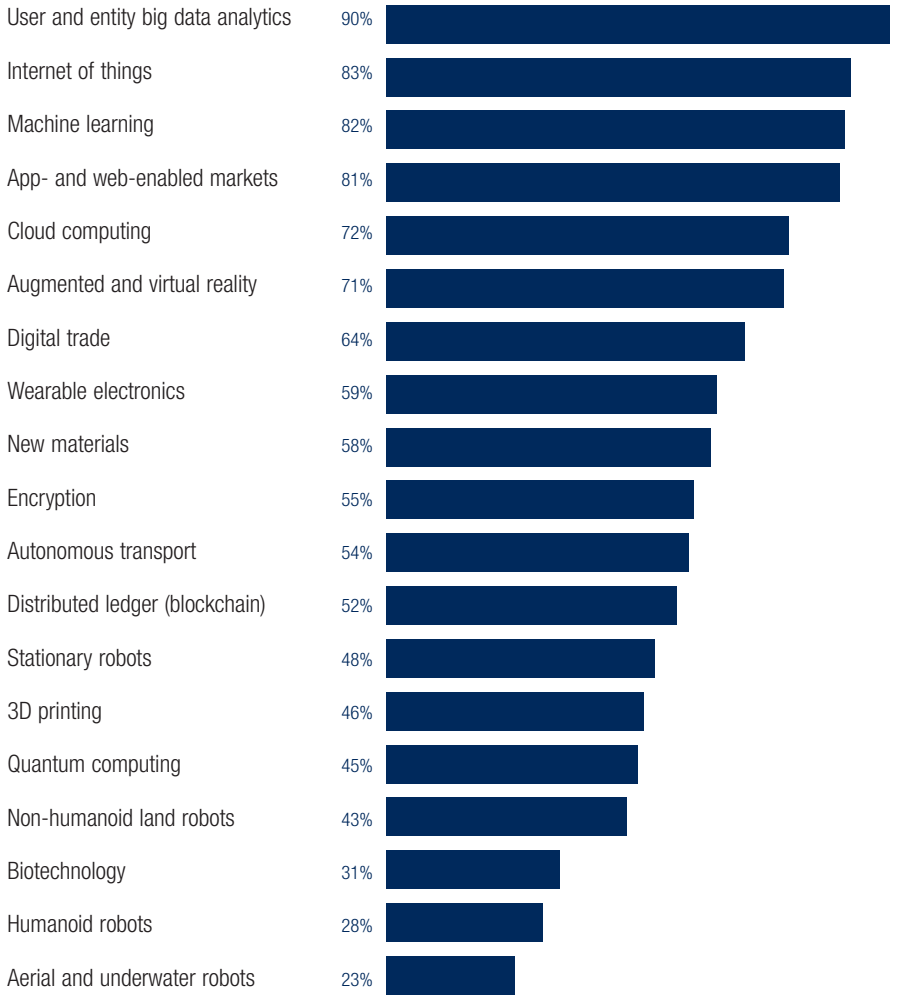
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Production cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Geographic concentration
Consumer	Talent availability	Labour cost	Geographic concentration
Energy Utilities & Technologies	Geographic concentration	Production cost	Talent availability
Financial Services & Investors	Talent availability	Labour cost	Organization HQ
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Production cost	Geographic concentration	Talent availability
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Sales and Marketing Professionals
Managing Directors and Chief Executives
Data Analysts and Scientists
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Assembly and Factory Workers
Financial and Investment Advisers
Business Services and Administration Managers

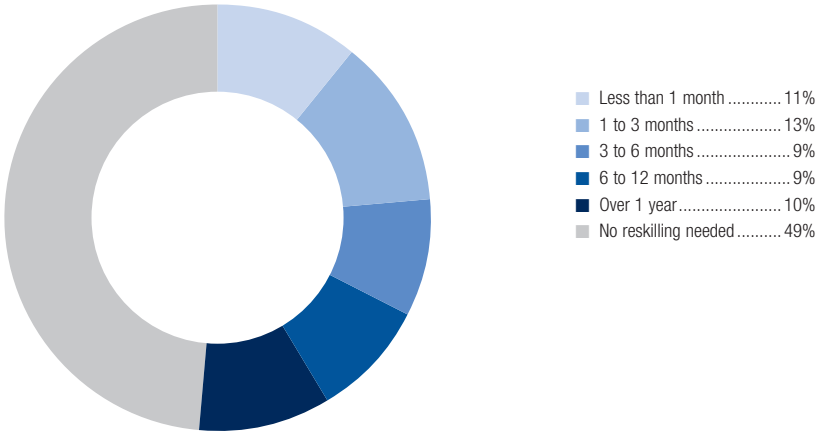
Technology adoption *(share of companies surveyed)*



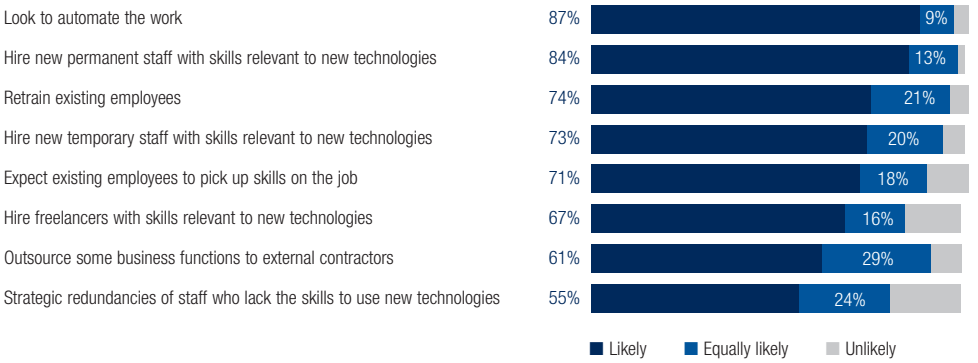
Country Profile

Australia

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Creativity, originality and initiative
Analytical thinking and innovation
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Critical thinking and analysis
Leadership and social influence
Emotional intelligence
Reasoning, problem-solving and ideation
Resilience, stress tolerance and flexibility

Projected use of training providers *(share of training)*

Country Profile
Brazil

Factors determining job location decisions

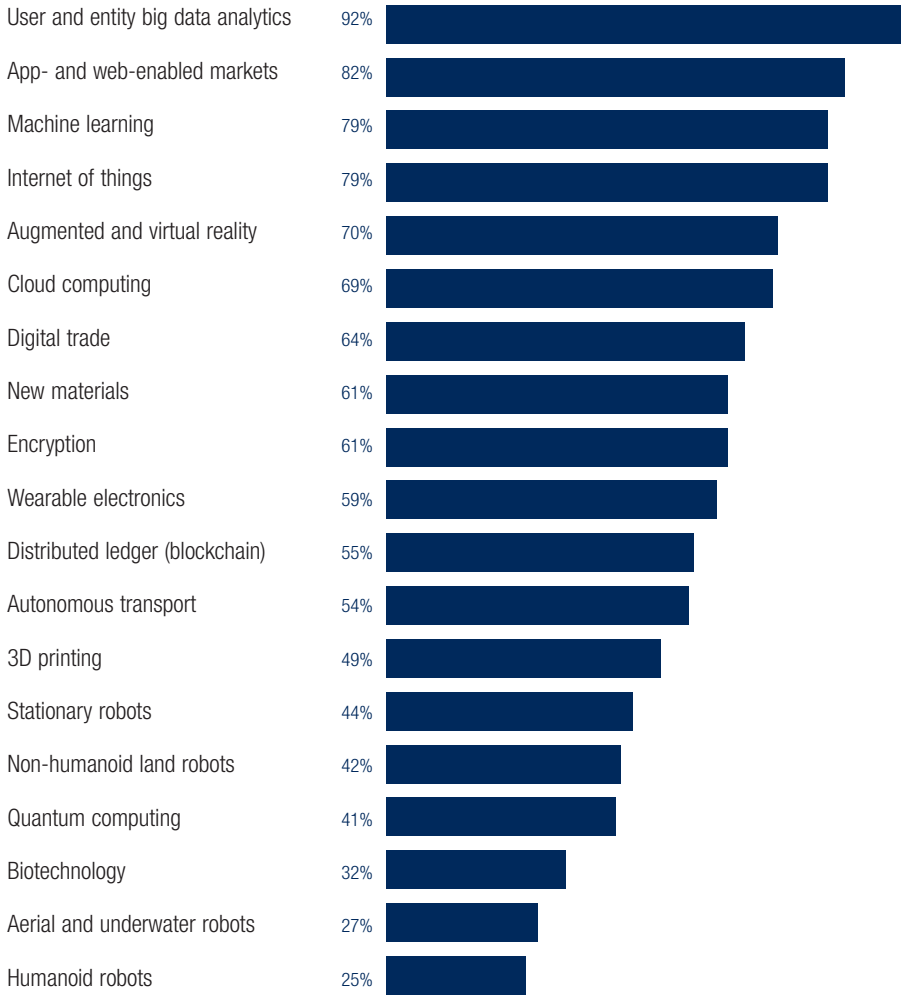
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Production cost	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Production cost	Talent availability	Quality of the supply chain
Financial Services & Investors	Talent availability	Geographic concentration	Organization HQ
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Organization HQ
Oil & Gas	Production cost	Talent availability	Organization HQ
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Data Analysts and Scientists
Sales and Marketing Professionals
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial Analysts
Database and Network Professionals
Financial and Investment Advisers

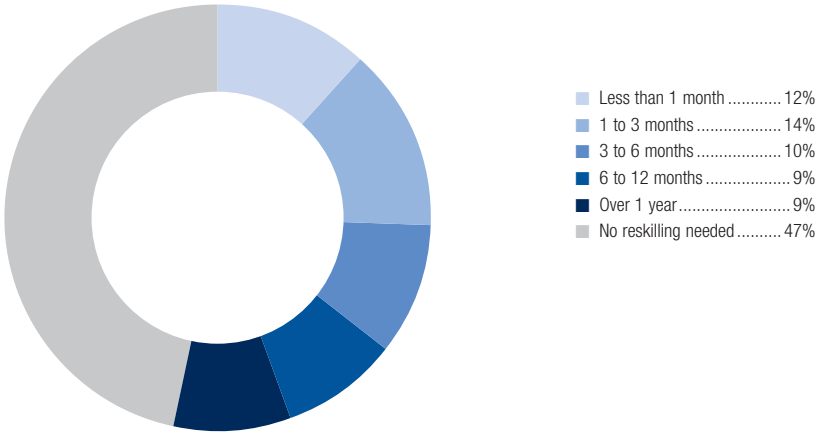
Technology adoption *(share of companies surveyed)*



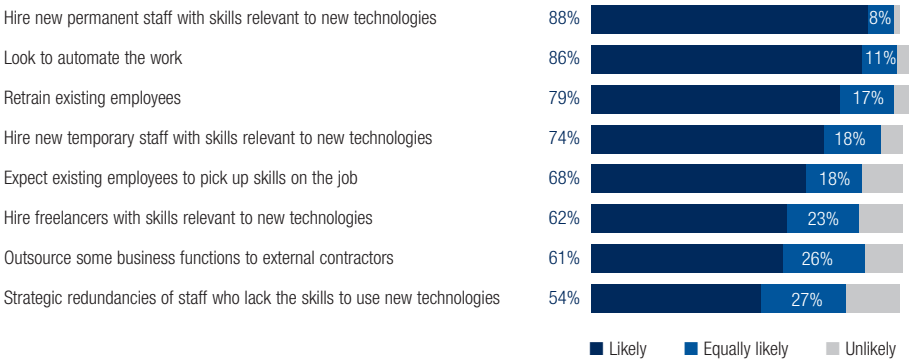
Country Profile

Brazil

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Reasoning, problem-solving and ideation
Leadership and social influence
Critical thinking and analysis
Complex problem-solving
Resilience, stress tolerance and flexibility
Emotional intelligence

Projected use of training providers *(share of training)*

Country Profile
China

Factors determining job location decisions

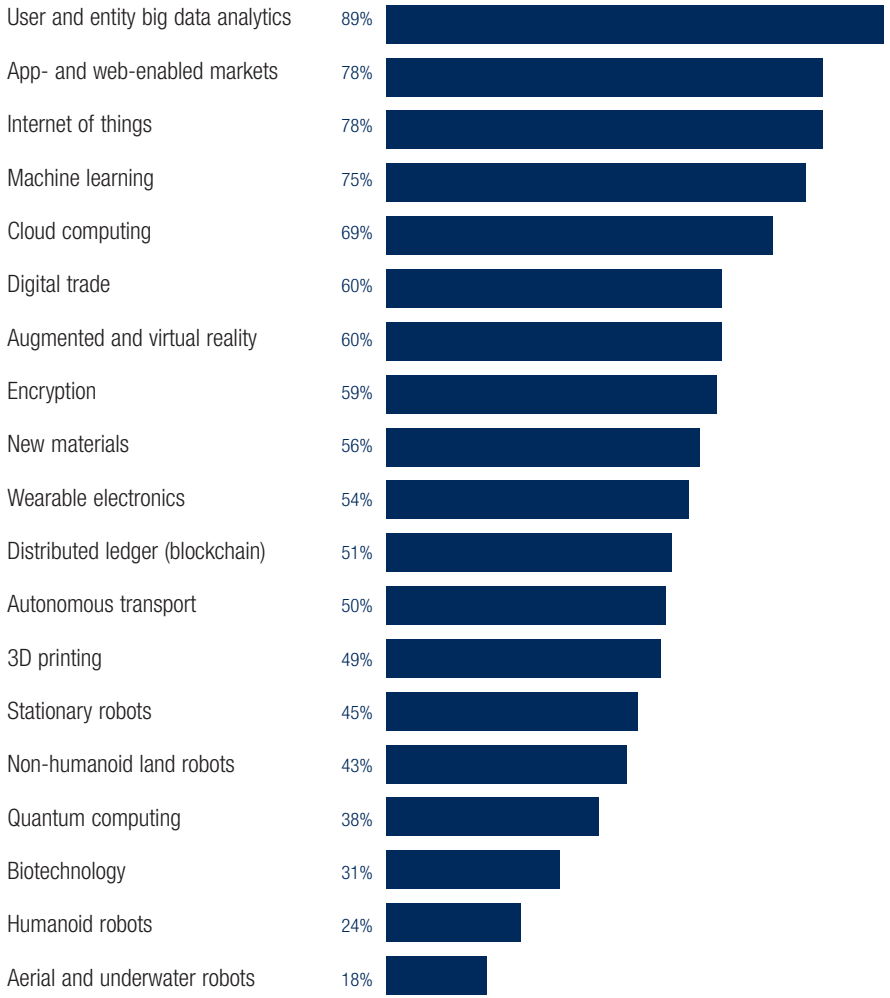
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Production cost	Quality of the supply chain
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Talent availability	Quality of the supply chain	Production cost
Energy Utilities & Technologies	Production cost	Labour cost	Location of raw materials
Financial Services & Investors	Talent availability	Labour cost	Organization HQ
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Production cost	Talent availability	Geographic concentration
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Sales and Marketing Professionals
Managing Directors and Chief Executives
Data Analysts and Scientists
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Assembly and Factory Workers
Financial and Investment Advisers
Database and Network Professionals

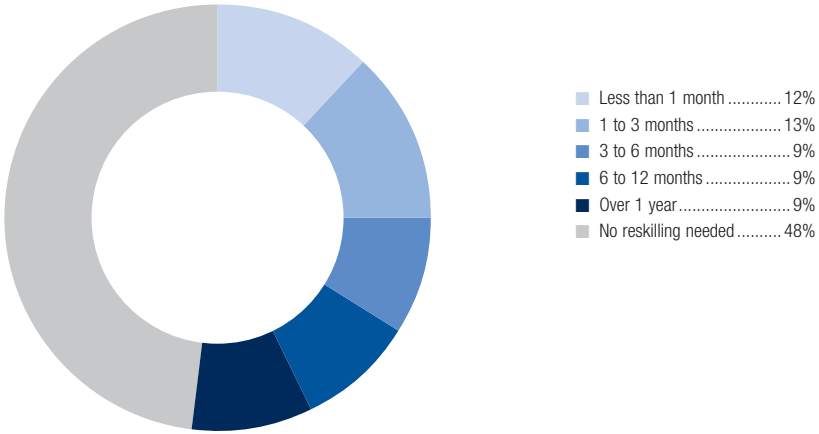
Technology adoption *(share of companies surveyed)*



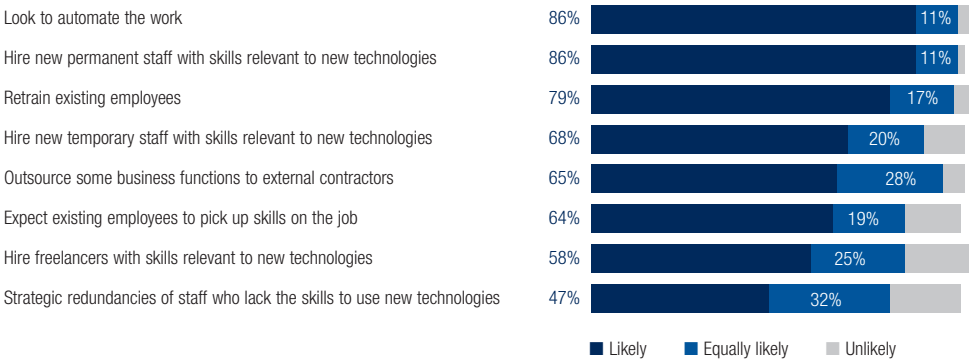
Country Profile

China

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Creativity, originality and initiative
Analytical thinking and innovation
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Critical thinking and analysis
Emotional intelligence
Leadership and social influence
Systems analysis and evaluation
Reasoning, problem-solving and ideation

Projected use of training providers *(share of training)*

Country Profile
France

Factors determining job location decisions

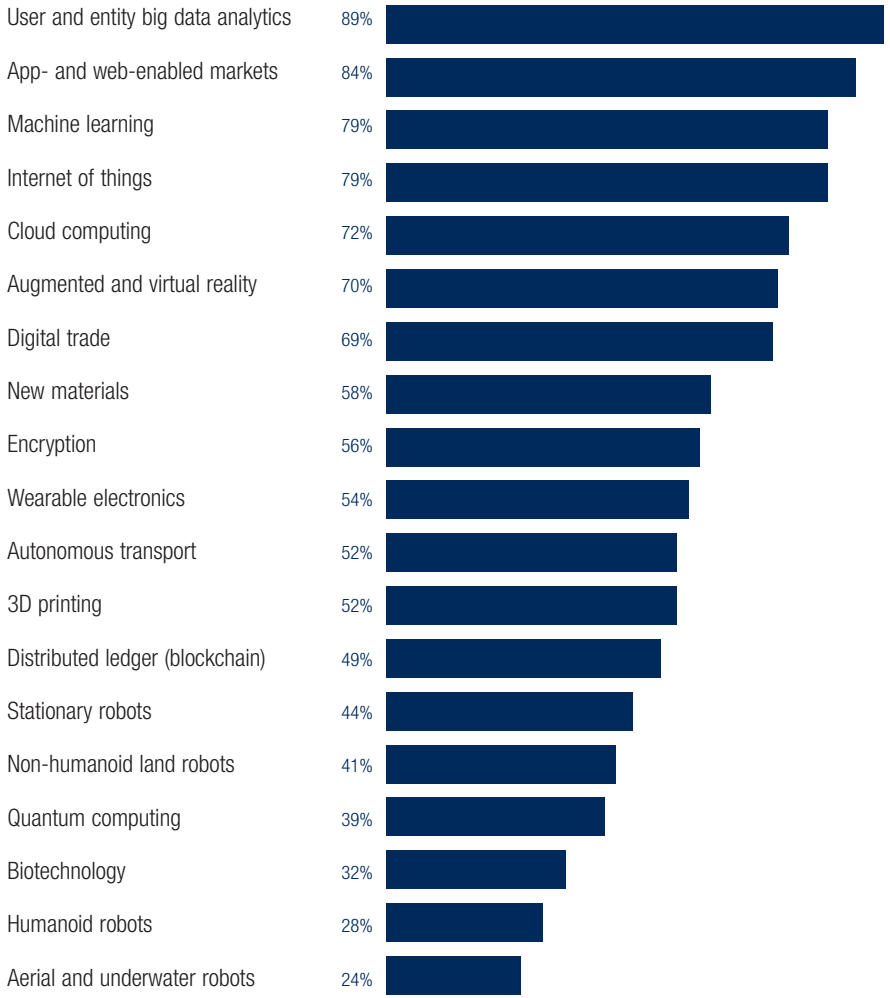
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Production cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Production cost	Labour cost
Consumer	Labour cost	Geographic concentration	Talent availability
Energy Utilities & Technologies	Labour cost	Production cost	Talent availability
Financial Services & Investors	Talent availability	Labour cost	Organization HQ
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Organization HQ
Oil & Gas	Geographic concentration	Talent availability	Organization HQ
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Managing Directors and Chief Executives
Software and Applications Developers and Analysts
Sales and Marketing Professionals
General and Operations Managers
Data Analysts and Scientists
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Assembly and Factory Workers
Human Resources Specialists
Financial and Investment Advisers
Financial Analysts

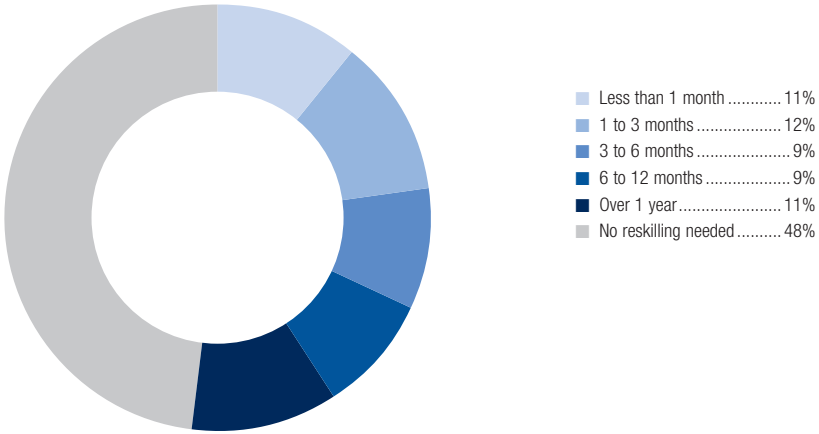
Technology adoption *(share of companies surveyed)*



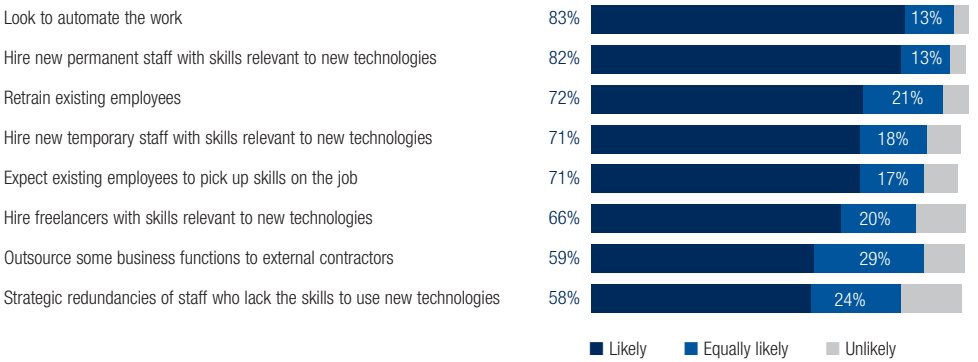
Country Profile

France

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Creativity, originality and initiative
Analytical thinking and innovation
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Critical thinking and analysis
Leadership and social influence
Emotional intelligence
Reasoning, problem-solving and ideation
Resilience, stress tolerance and flexibility

Projected use of training providers *(share of training)*

Country Profile
Germany

Factors determining job location decisions

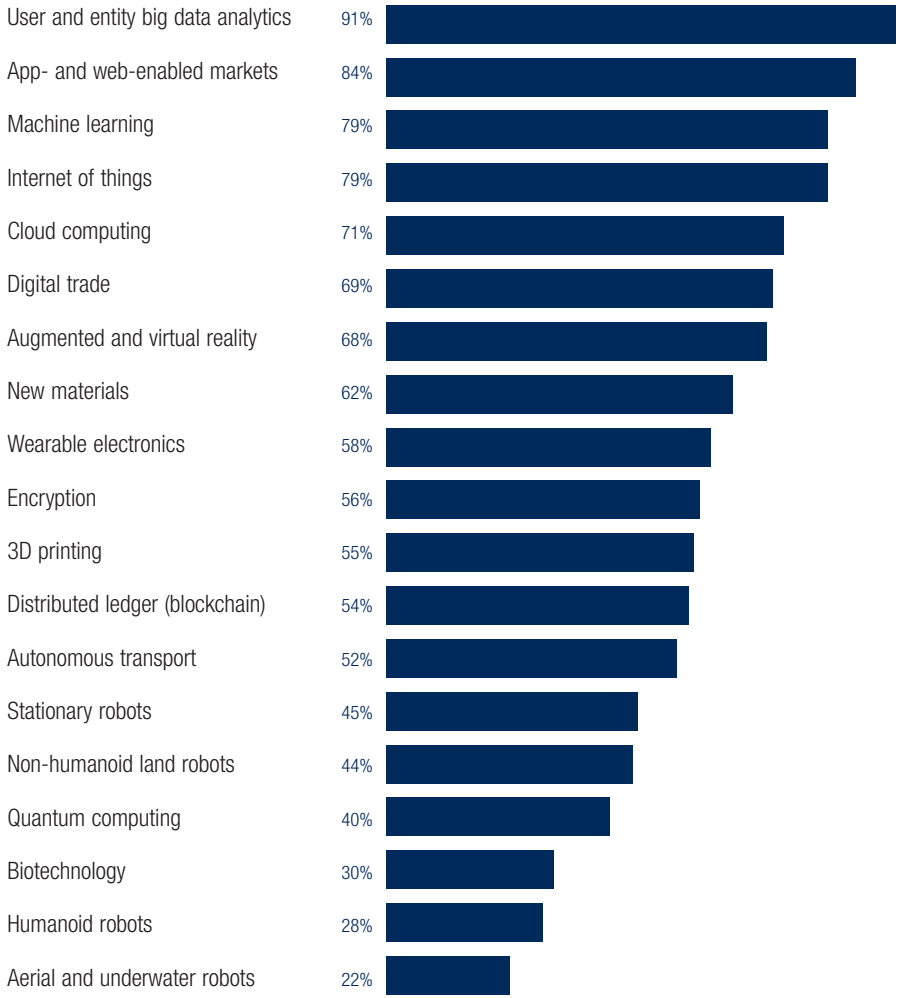
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Production cost	Quality of the supply chain
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Labour cost	Talent availability	Production cost
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Labour cost	Talent availability	Production cost
Financial Services & Investors	Talent availability	Geographic concentration	Labour cost
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Geographic concentration	Talent availability	Production cost
Professional Services	Talent availability	Strong local ed. provision	Geographic concentration

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Sales and Marketing Professionals
General and Operations Managers
Data Analysts and Scientists
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Assembly and Factory Workers
Human Resources Specialists
Financial and Investment Advisers
Financial Analysts

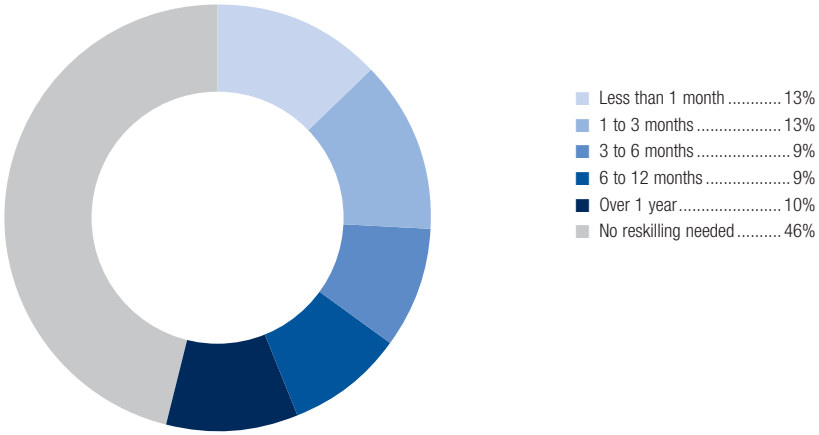
Technology adoption *(share of companies surveyed)*



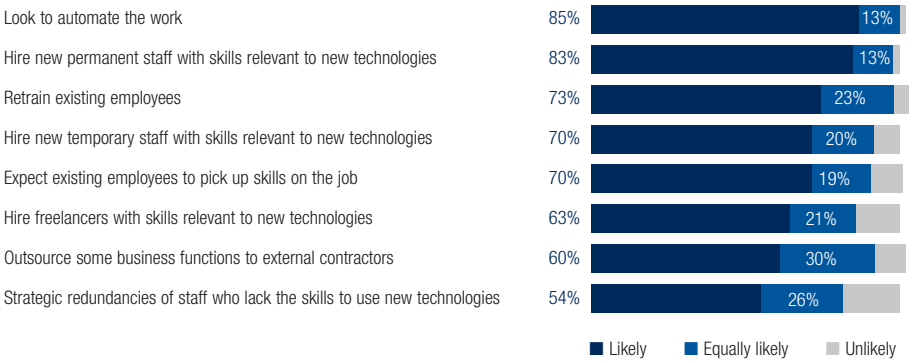
Country Profile

Germany

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Critical thinking and analysis
Complex problem-solving
Leadership and social influence
Emotional intelligence
Resilience, stress tolerance and flexibility
Systems analysis and evaluation

Projected use of training providers *(share of training)*

Country Profile
India

Factors determining job location decisions

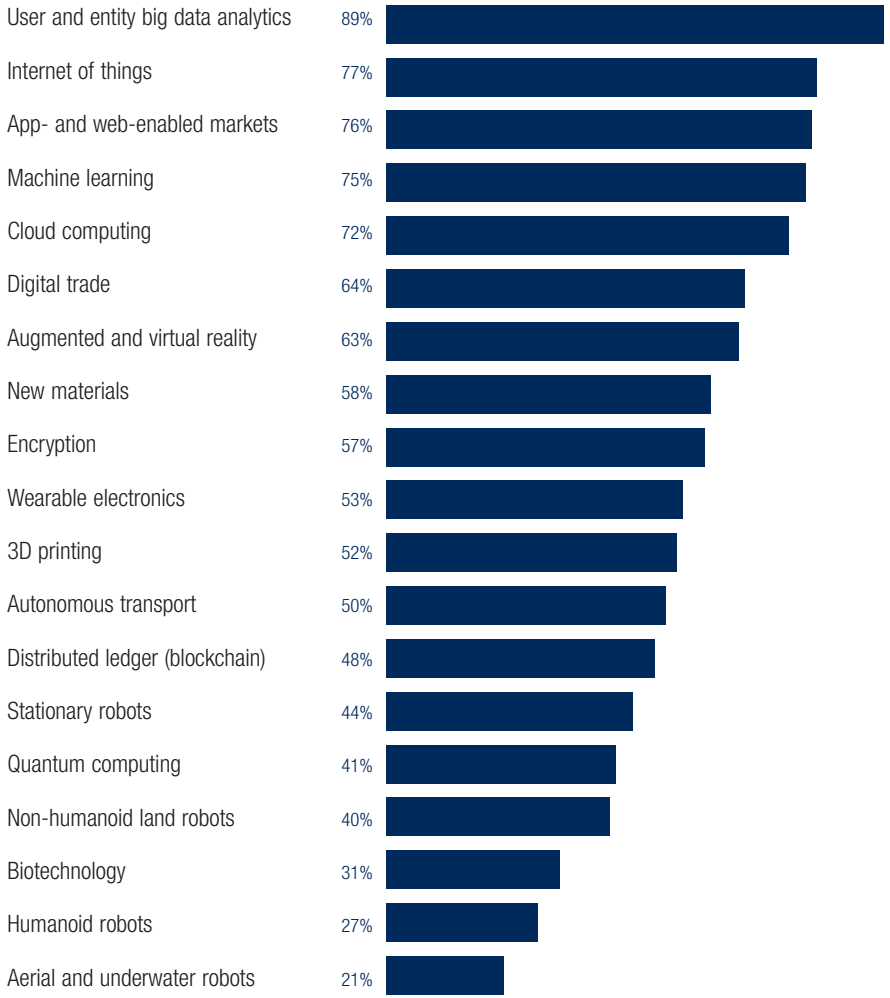
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Labour cost	Quality of the supply chain
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Production cost	Labour cost
Consumer	Talent availability	Labour cost	Quality of the supply chain
Energy Utilities & Technologies	Talent availability	Labour cost	Production cost
Financial Services & Investors	Talent availability	Organization HQ	Ease of importing talent
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Labour cost	Production cost	Other (please specify)
Professional Services	Talent availability	Labour cost	Strong local ed. provision

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Managing Directors and Chief Executives
Sales and Marketing Professionals
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Software and Applications Developers and Analysts
General and Operations Managers
Data Analysts and Scientists
Assembly and Factory Workers
Human Resources Specialists
Financial Analysts
Financial and Investment Advisers

Technology adoption *(share of companies surveyed)*



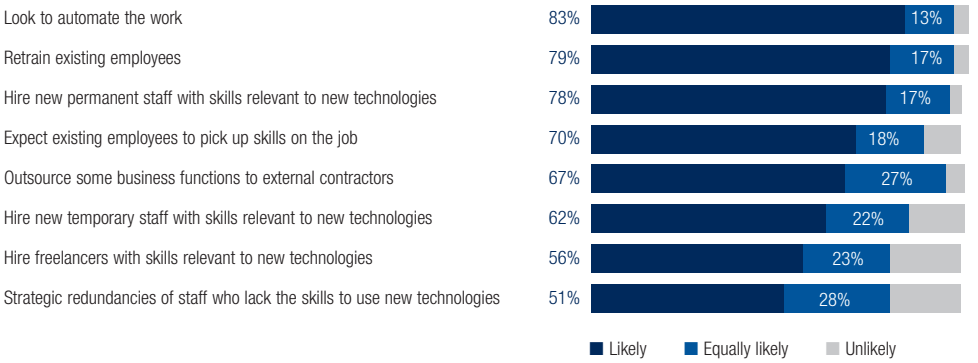
Country Profile

India

Average reskilling needs *(share of workforce)*

- Less than 1 month 13%
- 1 to 3 months 13%
- 3 to 6 months 9%
- 6 to 12 months 9%
- Over 1 year 10%
- No reskilling needed 46%

Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Active learning and learning strategies
Creativity, originality and initiative
Technology design and programming
Critical thinking and analysis
Complex problem-solving
Leadership and social influence
Reasoning, problem-solving and ideation
Emotional intelligence
Systems analysis and evaluation

Projected use of training providers *(share of training)*

Country Profile
Indonesia

Factors determining job location decisions

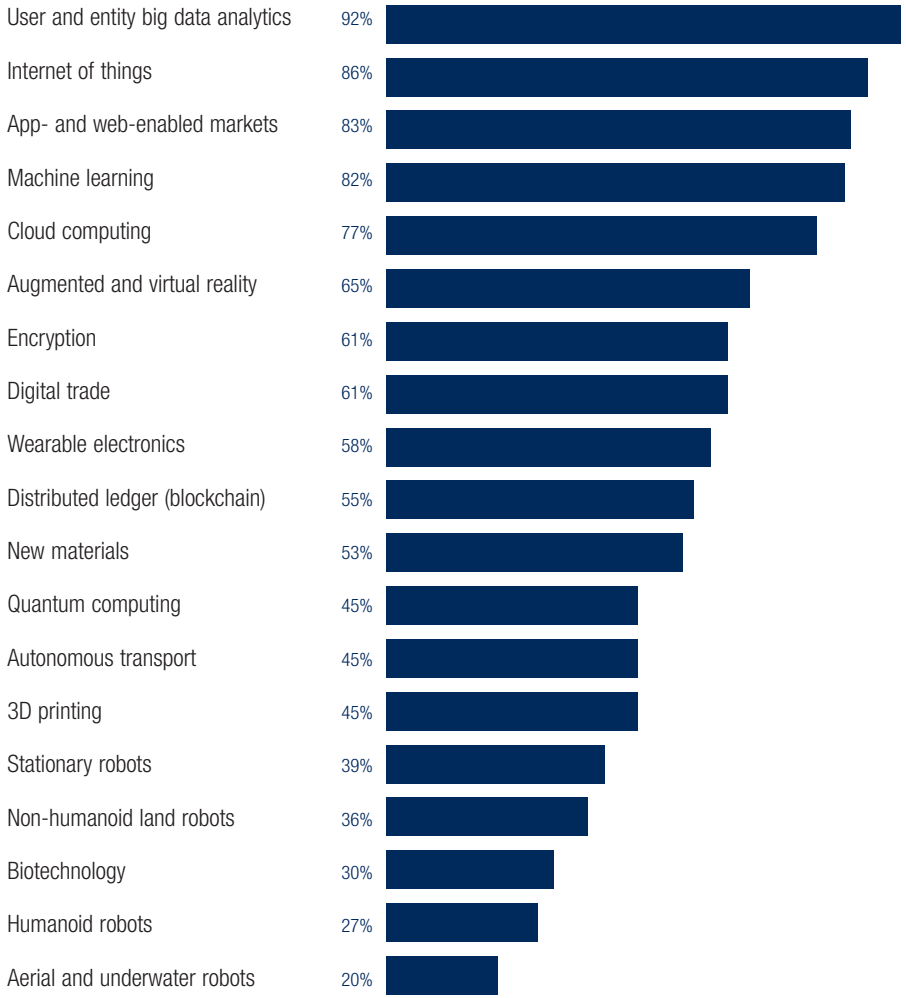
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Production cost
Aviation, Travel & Tourism	Talent availability	Ease of importing talent	Organization HQ
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Geographic concentration
Consumer	Talent availability	Labour cost	Production cost
Energy Utilities & Technologies	Production cost	Talent availability	Quality of the supply chain
Financial Services & Investors	Talent availability	Labour cost	Organization HQ
Global Health & Healthcare	Talent availability	Production cost	Labour cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Talent availability	Production cost	Geographic concentration
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Sales and Marketing Professionals
Data Analysts and Scientists
Managing Directors and Chief Executives
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial and Investment Advisers
Financial Analysts
Robotics Specialists and Engineers

Technology adoption *(share of companies surveyed)*



Country Profile
Mexico

Factors determining job location decisions

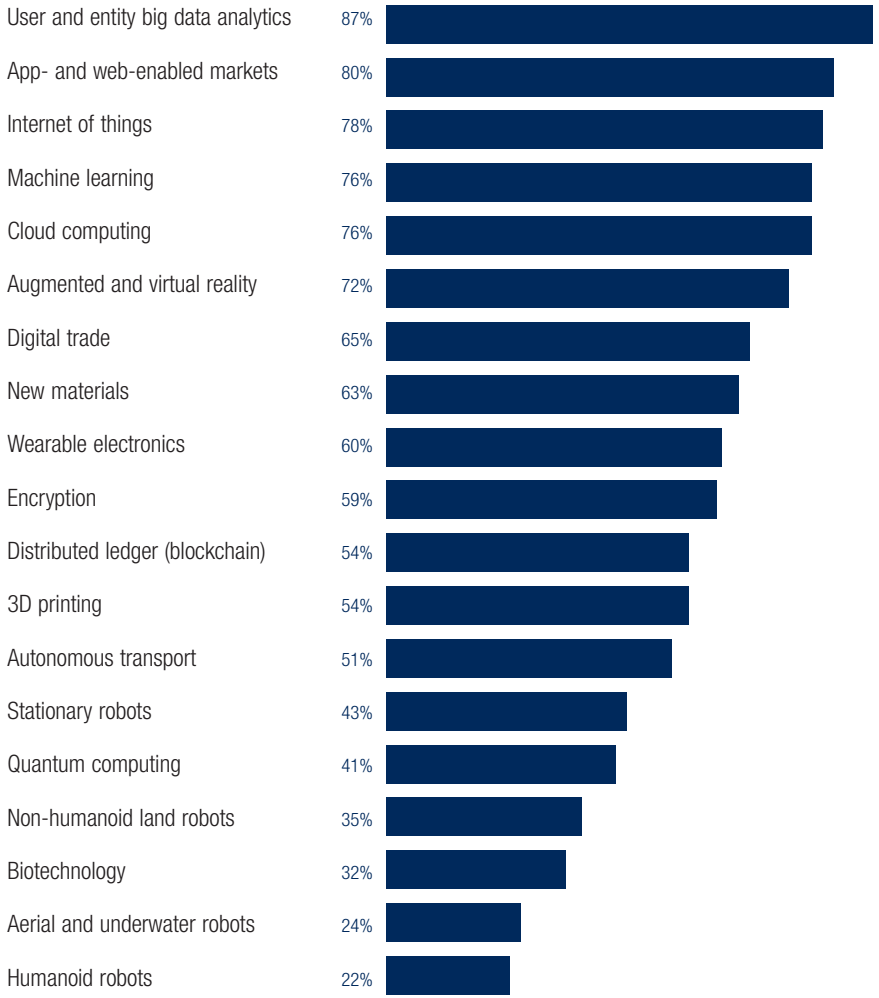
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Production cost	Labour cost
Aviation, Travel & Tourism	Talent availability	Ease of importing talent	Organization HQ
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Quality of the supply chain
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Production cost	Labour cost	Talent availability
Financial Services & Investors	Talent availability	Labour cost	Strong local ed. provision
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Ease of importing talent
Oil & Gas	Talent availability	Production cost	Location of raw materials
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Managing Directors and Chief Executives
Software and Applications Developers and Analysts
Data Analysts and Scientists
Sales and Marketing Professionals
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial and Investment Advisers
Assembly and Factory Workers
Financial Analysts

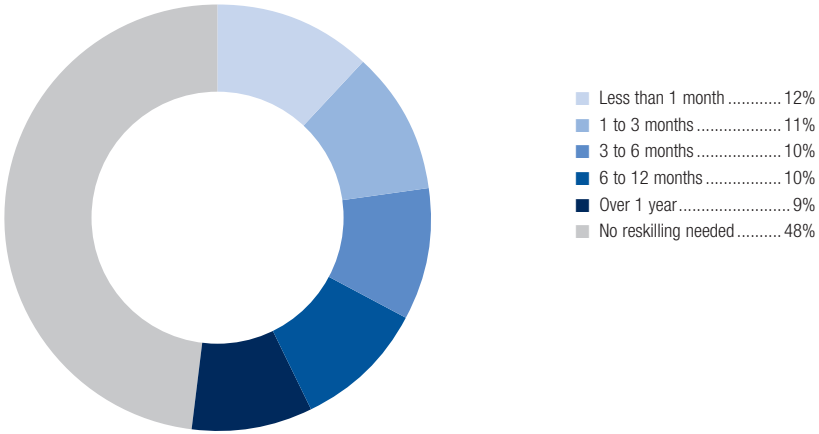
Technology adoption *(share of companies surveyed)*



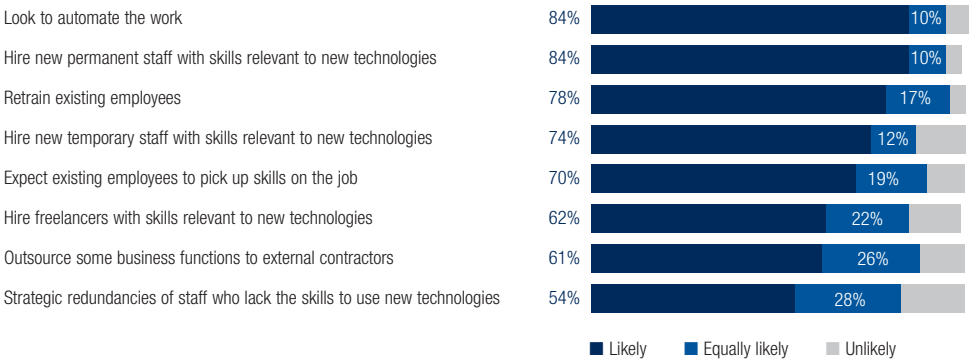
Country Profile

Mexico

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Reasoning, problem-solving and ideation
Complex problem-solving
Leadership and social influence
Critical thinking and analysis
Resilience, stress tolerance and flexibility
Emotional intelligence

Projected use of training providers *(share of training)*

Country Profile
Philippines

Factors determining job location decisions

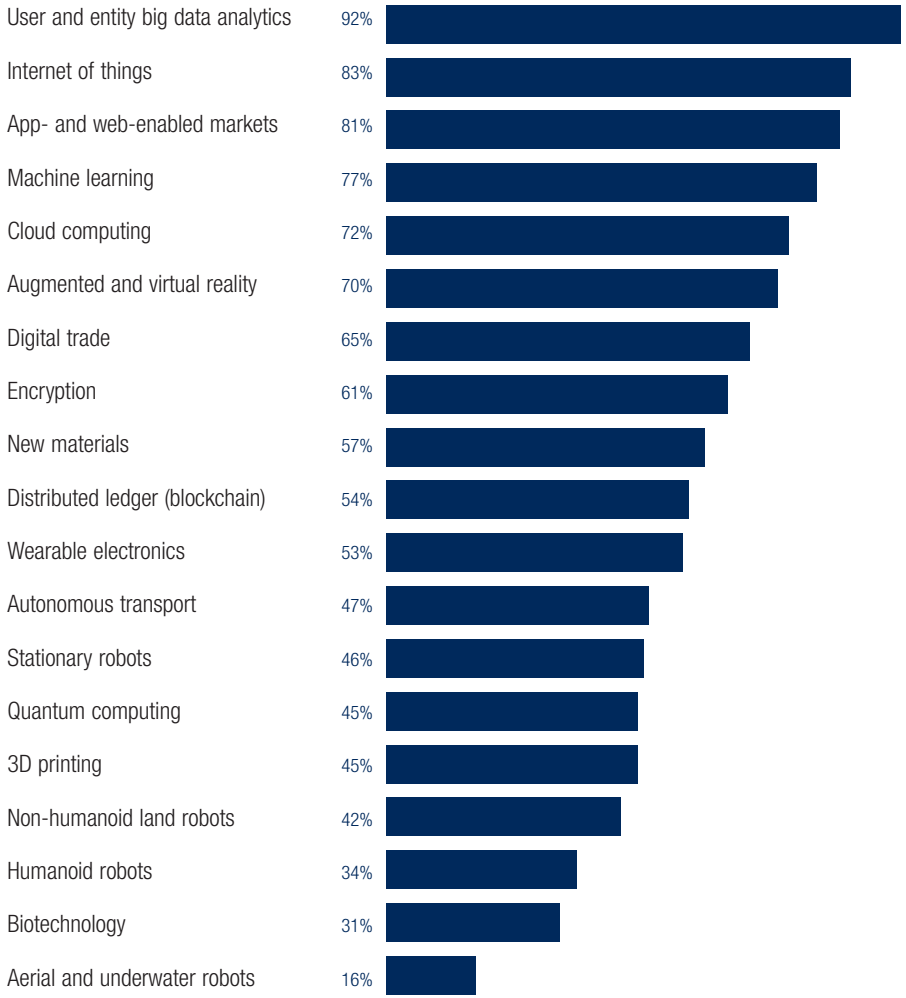
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Production cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Labour cost	Talent availability	Production cost
Consumer	Talent availability	Quality of the supply chain	Production cost
Financial Services & Investors	Labour cost	Talent availability	Ease of importing talent
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Professional Services	Talent availability	Labour cost	Strong local ed. provision

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Sales and Marketing Professionals
Managing Directors and Chief Executives
Data Analysts and Scientists
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
General and Operations Managers
Human Resources Specialists
Financial and Investment Advisers
Assembly and Factory Workers
Database and Network Professionals

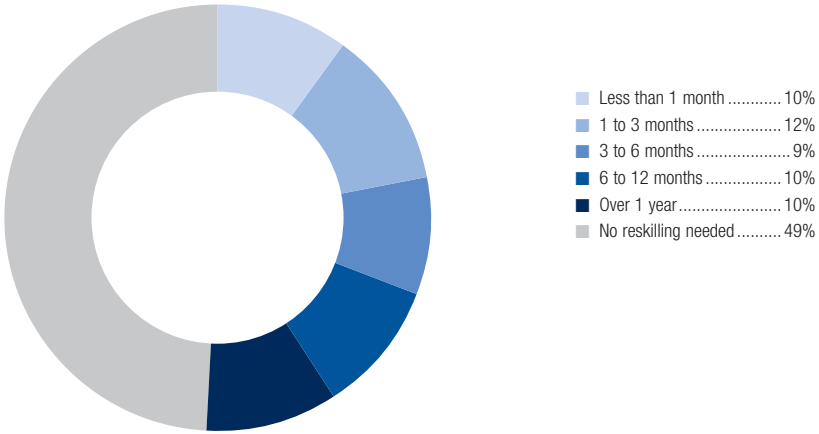
Technology adoption *(share of companies surveyed)*



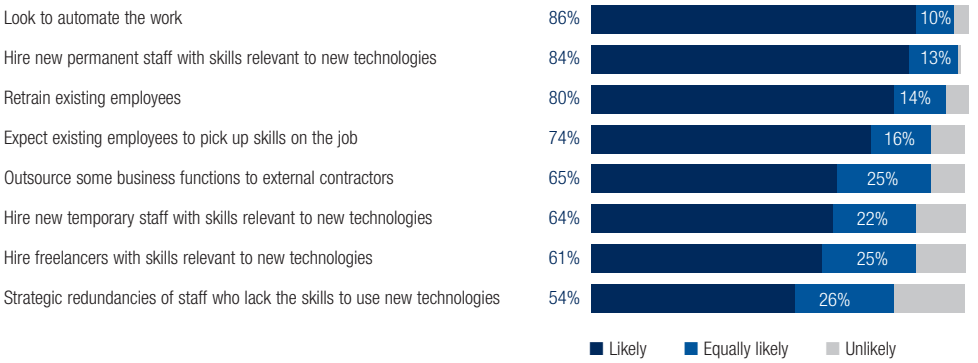
Country Profile

Philippines

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Active learning and learning strategies
Creativity, originality and initiative
Technology design and programming
Critical thinking and analysis
Complex problem-solving
Leadership and social influence
Emotional intelligence
Reasoning, problem-solving and ideation
Resilience, stress tolerance and flexibility

Projected use of training providers *(share of training)*

Country Profile

South Africa

Factors determining job location decisions

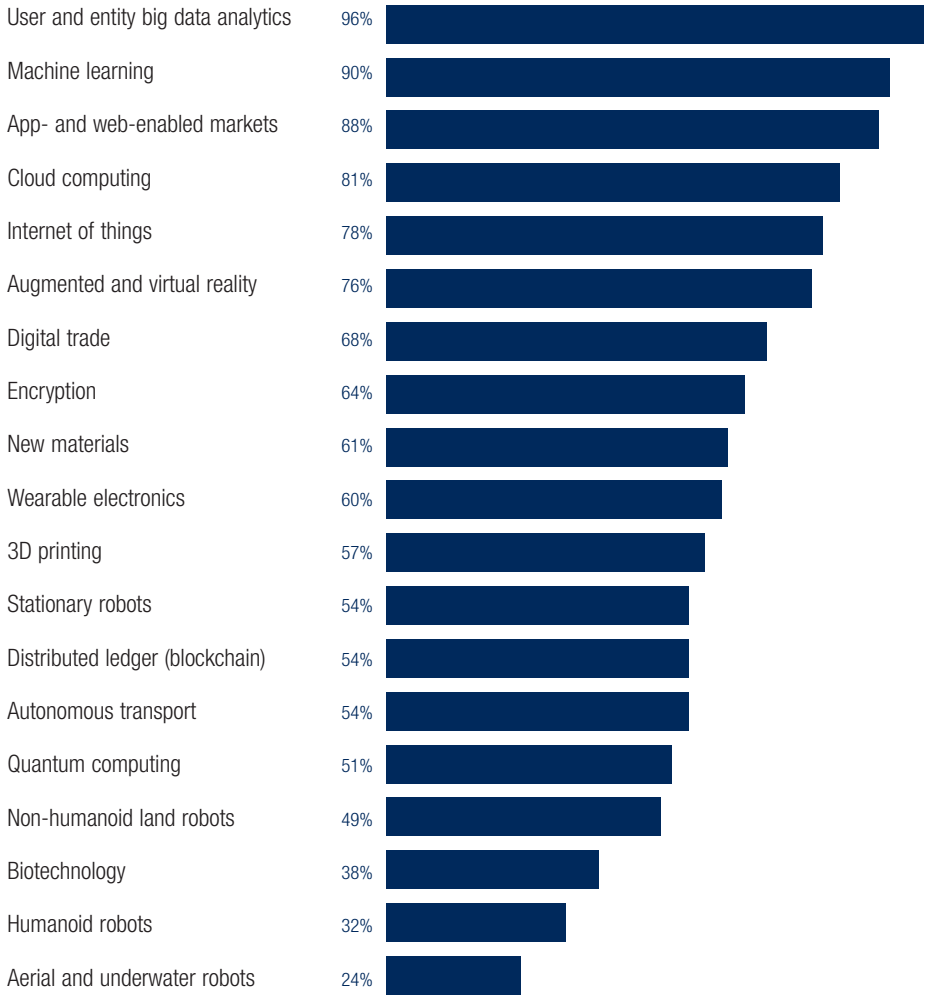
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Production cost	Talent availability	Quality of the supply chain
Aviation, Travel & Tourism	Talent availability	Organization HQ	Labour cost
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Geographic concentration
Consumer	Talent availability	Quality of the supply chain	Production cost
Energy Utilities & Technologies	Labour cost	Geographic concentration	Talent availability
Financial Services & Investors	Talent availability	Ease of importing talent	Strong local ed. provision
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Production cost	Geographic concentration	Talent availability
Professional Services	Talent availability	Geographic concentration	Strong local ed. provision

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Sales and Marketing Professionals
Managing Directors and Chief Executives
General and Operations Managers
Data Analysts and Scientists
Financial and Investment Advisers
Assembly and Factory Workers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Industrial and Production Engineers
Human Resources Specialists

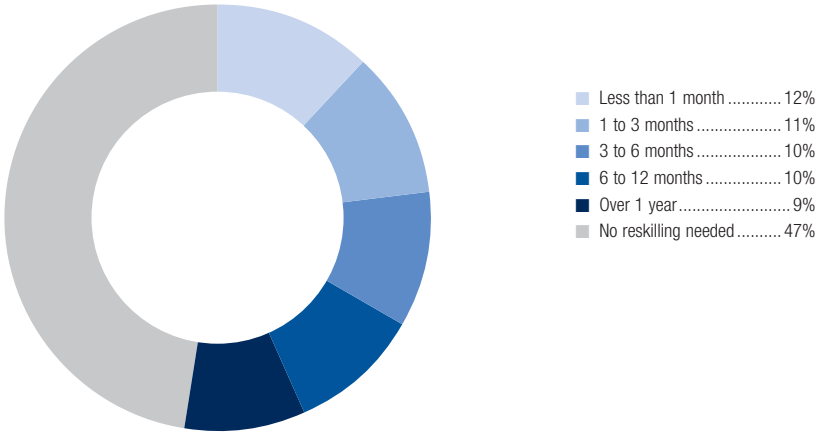
Technology adoption *(share of companies surveyed)*



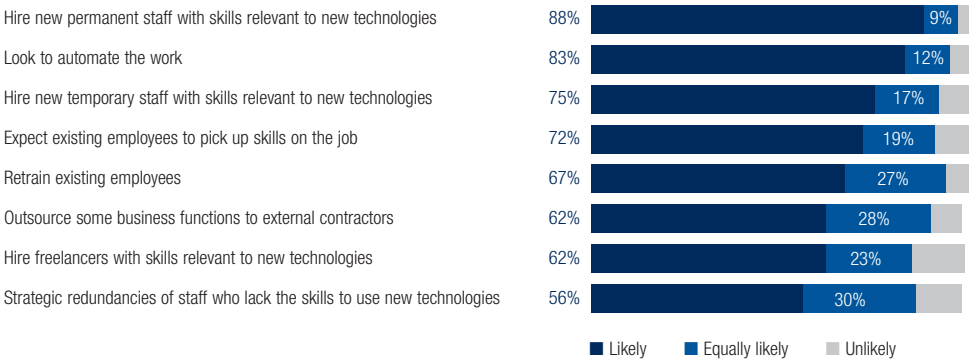
Country Profile

South Africa

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Leadership and social influence
Reasoning, problem-solving and ideation
Critical thinking and analysis
Resilience, stress tolerance and flexibility
Emotional intelligence

Projected use of training providers *(share of training)*

Country Profile
Switzerland

Factors determining job location decisions

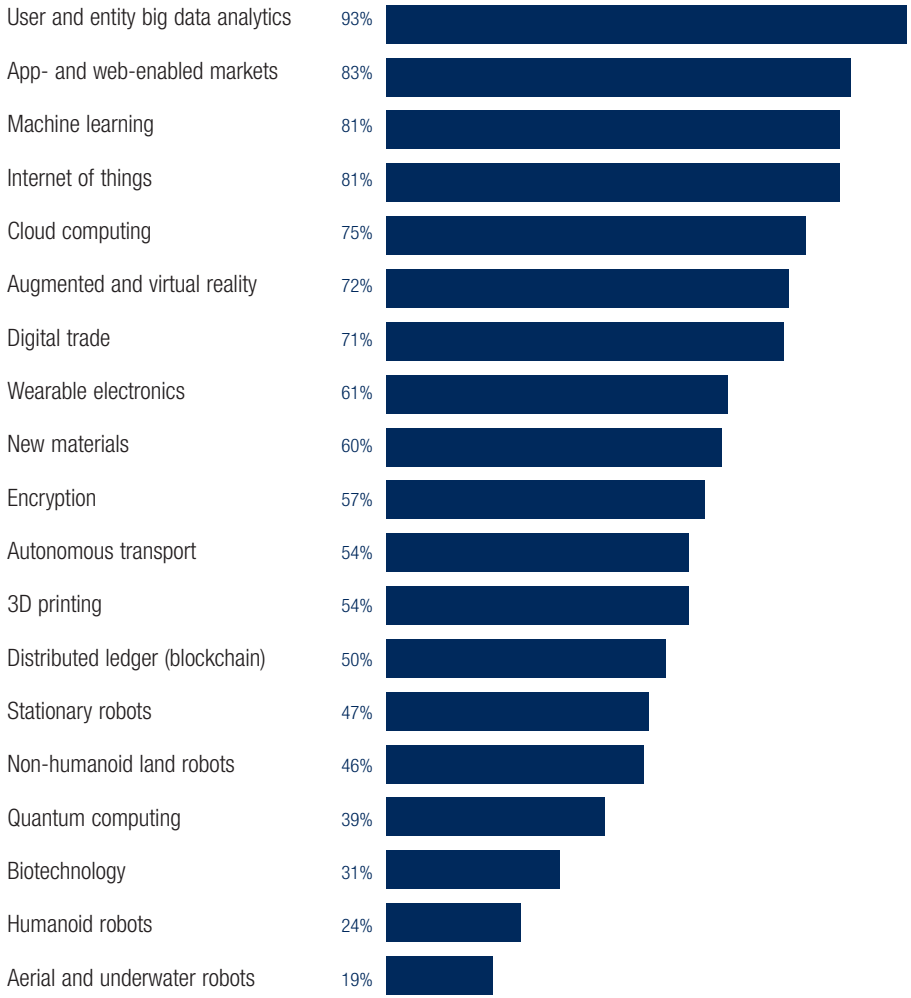
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Production cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Talent availability	Labour cost	Quality of the supply chain
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Organization HQ	Labour cost
Professional Services	Talent availability	Strong local ed. provision	Geographic concentration

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Managing Directors and Chief Executives
Sales and Marketing Professionals
Software and Applications Developers and Analysts
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
General and Operations Managers
Data Analysts and Scientists
Human Resources Specialists
Assembly and Factory Workers
Database and Network Professionals
Information Security Analysts

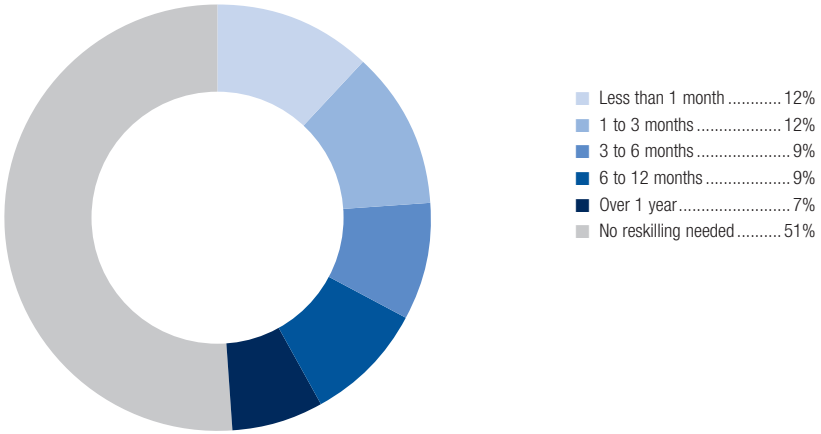
Technology adoption *(share of companies surveyed)*



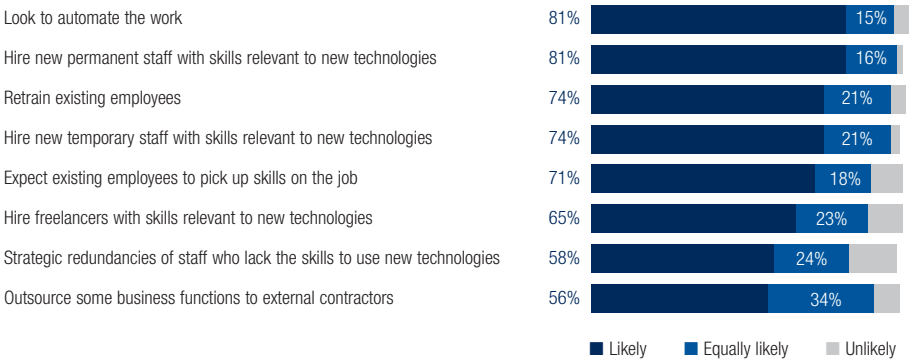
Country Profile

Switzerland

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Leadership and social influence
Emotional intelligence
Complex problem-solving
Critical thinking and analysis
Resilience, stress tolerance and flexibility
Systems analysis and evaluation

Projected use of training providers *(share of training)*

Country Profile
Thailand

Factors determining job location decisions

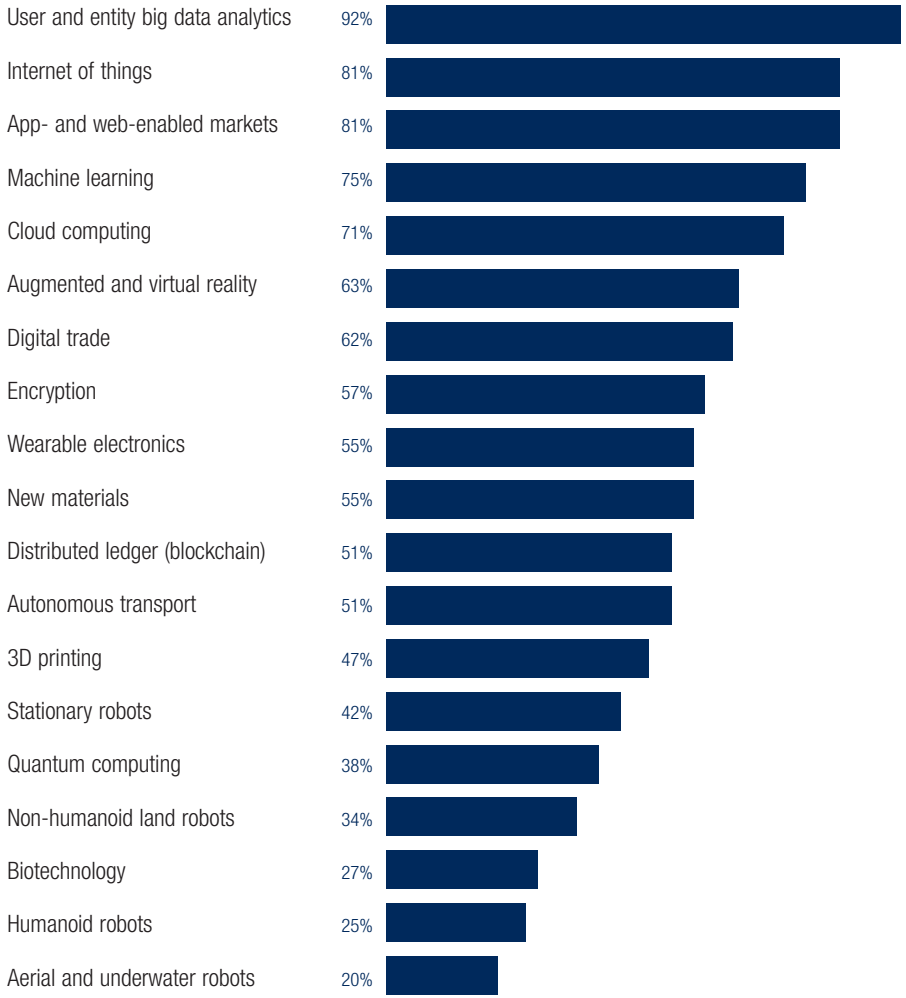
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Production cost	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Labour cost	Quality of the supply chain	Production cost
Energy Utilities & Technologies	Production cost	Labour cost	Talent availability
Financial Services & Investors	Talent availability	Labour cost	Geographic concentration
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Production cost	Talent availability	Labour cost
Professional Services	Talent availability	Labour cost	Geographic concentration

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Sales and Marketing Professionals
Data Analysts and Scientists
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
General and Operations Managers
Human Resources Specialists
Financial and Investment Advisers
Assembly and Factory Workers
Financial Analysts

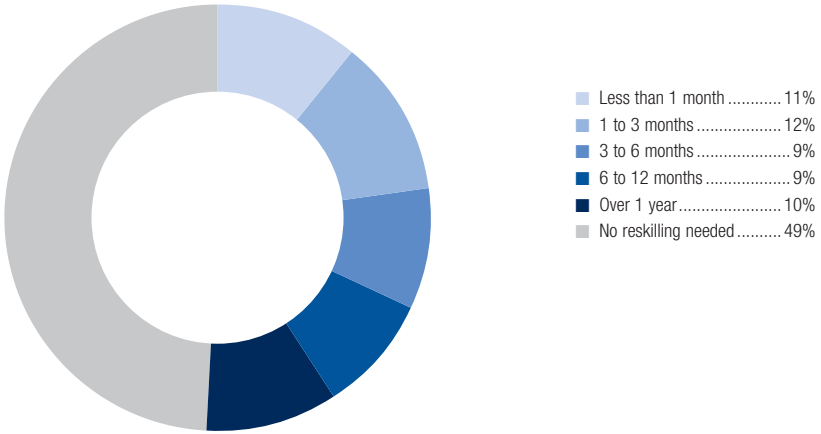
Technology adoption *(share of companies surveyed)*



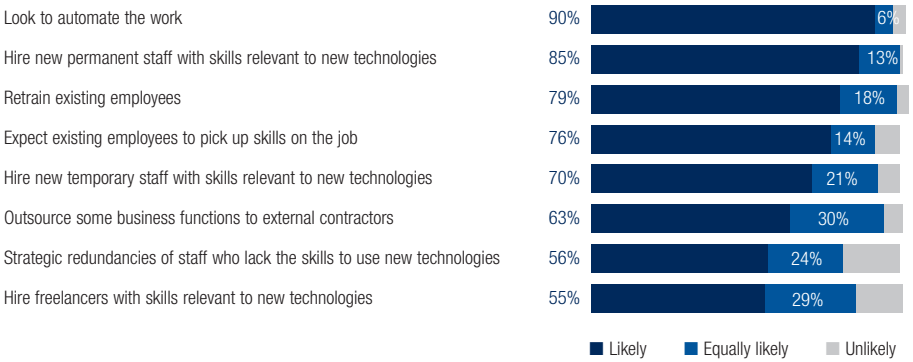
Country Profile

Thailand

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Leadership and social influence
Critical thinking and analysis
Systems analysis and evaluation
Reasoning, problem-solving and ideation
Emotional intelligence

Projected use of training providers *(share of training)*

Country Profile
United Kingdom

Factors determining job location decisions

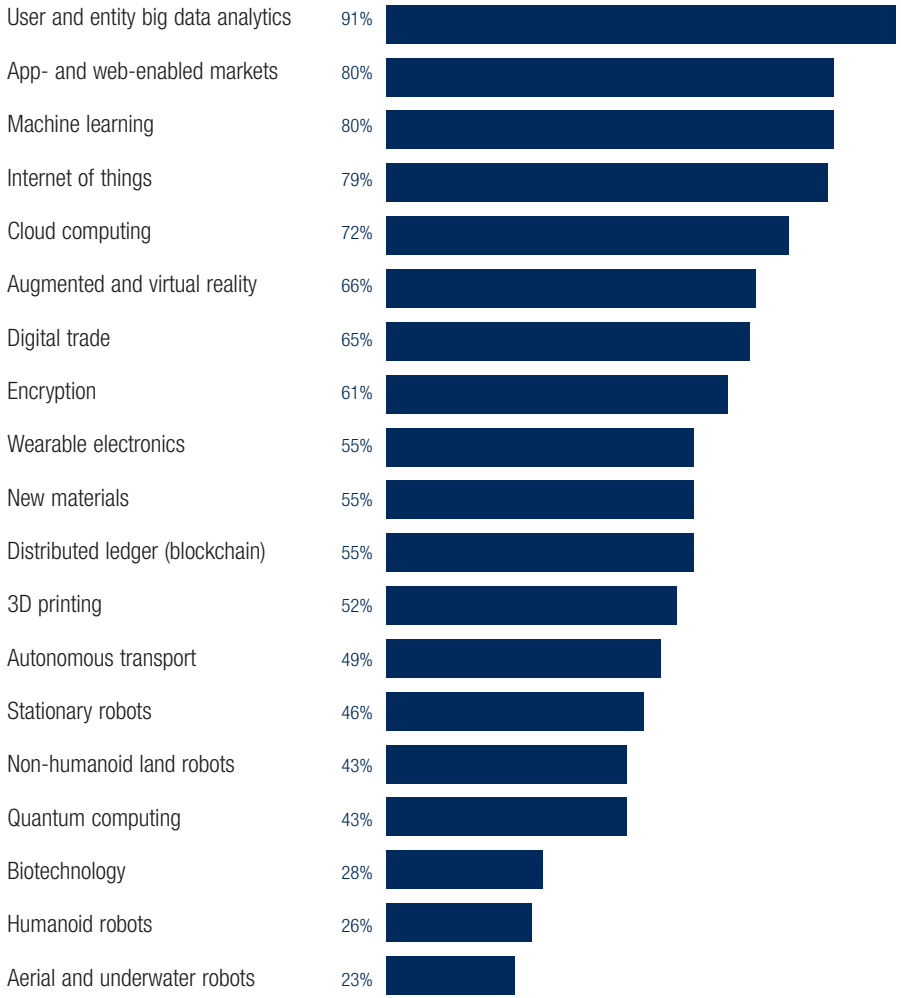
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Production cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Talent availability	Quality of the supply chain	Geographic concentration
Energy Utilities & Technologies	Talent availability	Labour cost	Production cost
Financial Services & Investors	Talent availability	Organization HQ	Labour cost
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Geographic concentration	Talent availability	Production cost
Professional Services	Talent availability	Strong local ed. provision	Geographic concentration

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Sales and Marketing Professionals
Data Analysts and Scientists
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Assembly and Factory Workers
Human Resources Specialists
Financial and Investment Advisers
Financial Analysts

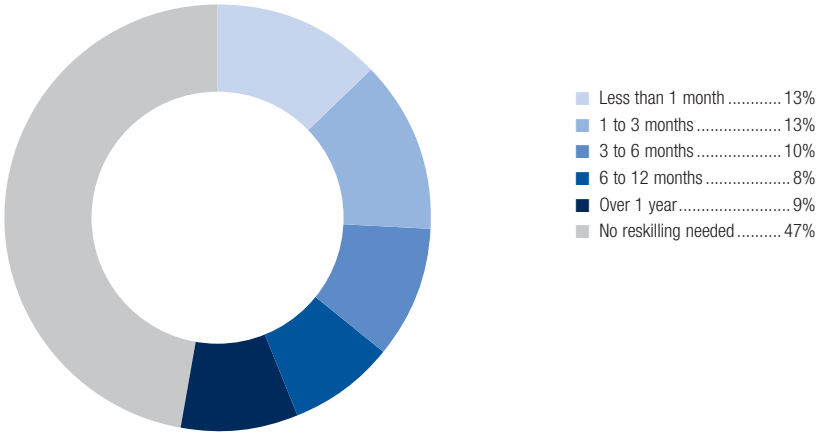
Technology adoption *(share of companies surveyed)*



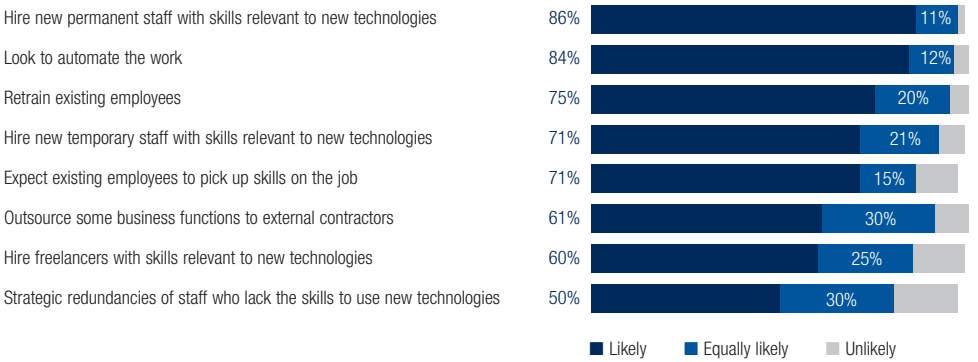
Country Profile

United Kingdom

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Critical thinking and analysis
Leadership and social influence
Systems analysis and evaluation
Reasoning, problem-solving and ideation
Emotional intelligence

Projected use of training providers *(share of training)*

Country Profile
United States

Factors determining job location decisions

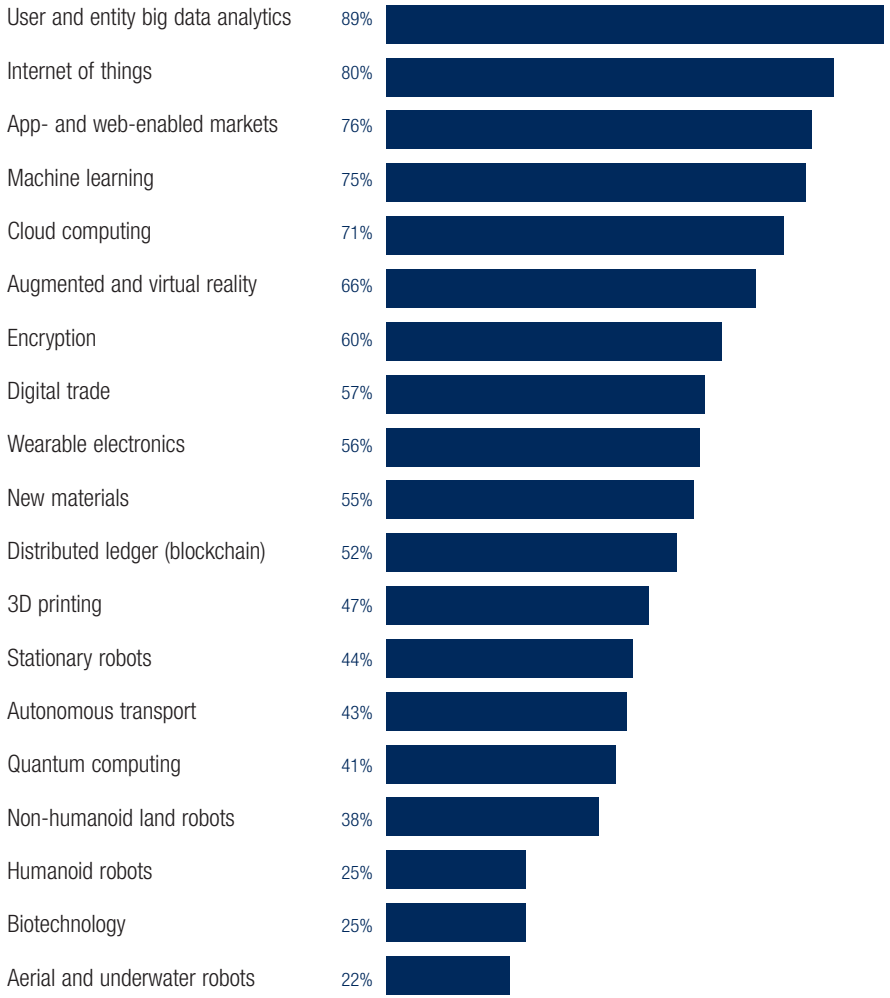
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Talent availability	Labour cost	Quality of the supply chain
Energy Utilities & Technologies	Labour cost	Talent availability	Production cost
Financial Services & Investors	Talent availability	Organization HQ	Labour cost
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Organization HQ
Infrastructure	Talent availability	Labour cost	Production cost
Oil & Gas	Talent availability	Labour cost	Production cost
Professional Services	Talent availability	Labour cost	Strong local ed. provision

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Data Analysts and Scientists
Managing Directors and Chief Executives
General and Operations Managers
Sales and Marketing Professionals
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial Analysts
Financial and Investment Advisers
Database and Network Professionals

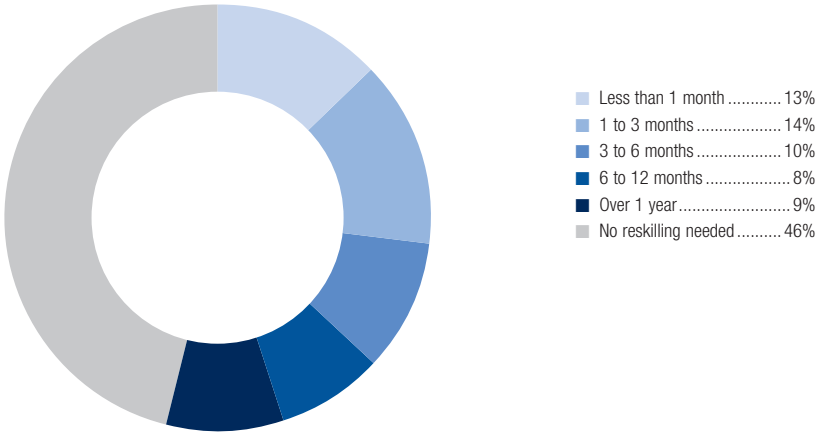
Technology adoption *(share of companies surveyed)*



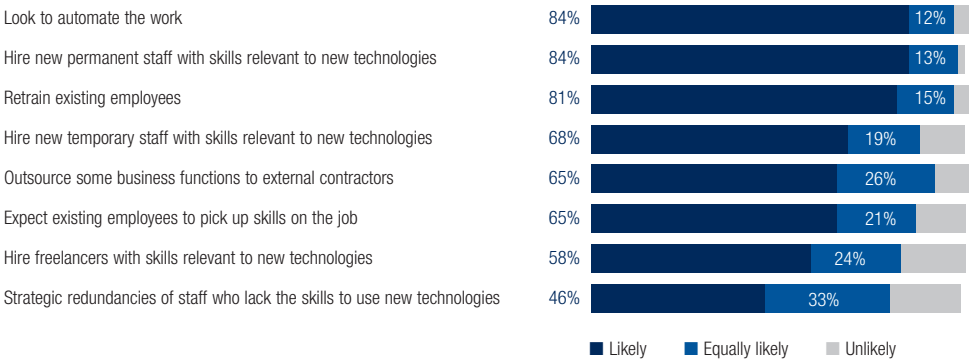
Country Profile

United States

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Critical thinking and analysis
Leadership and social influence
Reasoning, problem-solving and ideation
Emotional intelligence
Systems analysis and evaluation

Projected use of training providers *(share of training)*

Country Profile
Vietnam

Factors determining job location decisions

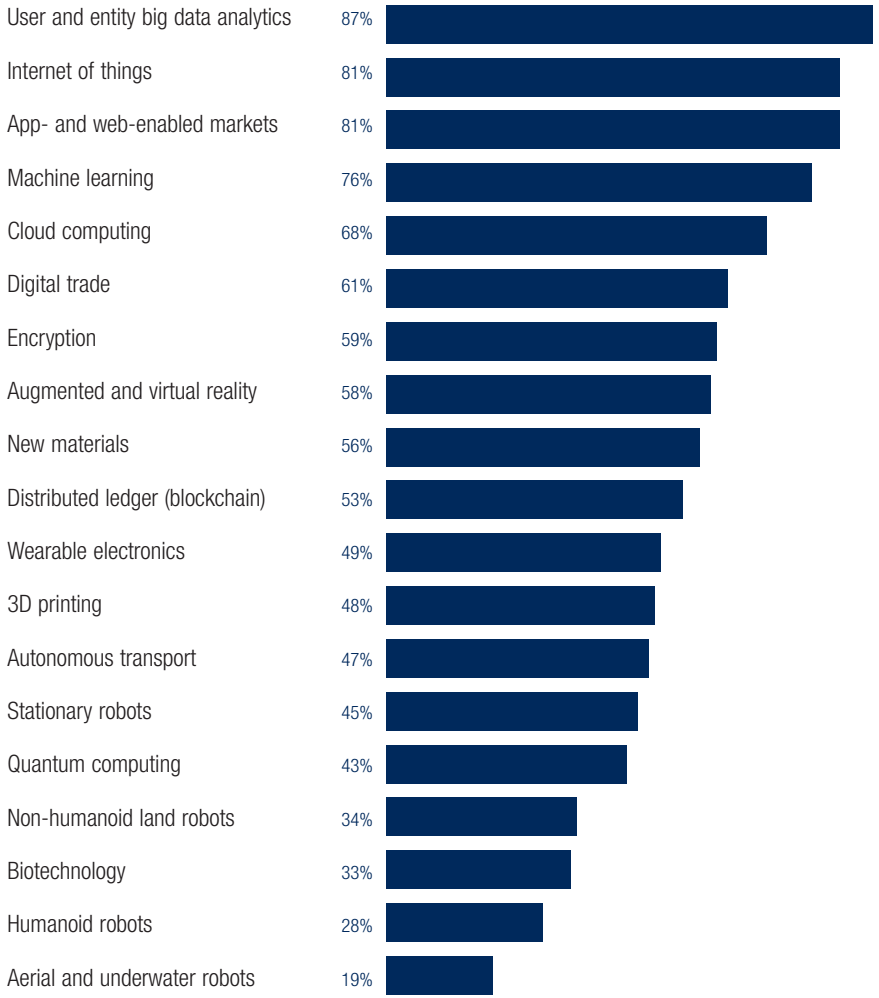
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Production cost	Talent availability	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Labour cost	Talent availability	Quality of the supply chain
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Labour cost	Geographic concentration	Talent availability
Financial Services & Investors	Talent availability	Ease of importing talent	Labour cost
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Talent availability	Production cost	Organization HQ
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Sales and Marketing Professionals
Data Analysts and Scientists
Managing Directors and Chief Executives
Software and Applications Developers and Analysts
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
General and Operations Managers
Human Resources Specialists
Financial and Investment Advisers
Financial Analysts
Assembly and Factory Workers

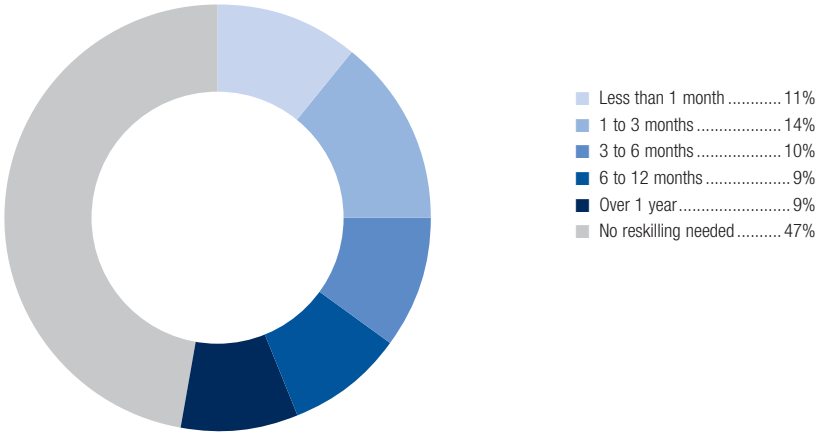
Technology adoption *(share of companies surveyed)*



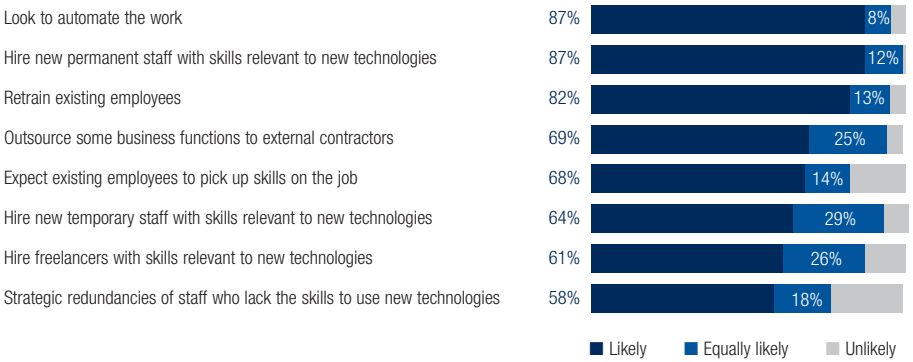
Country Profile

Vietnam

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Critical thinking and analysis
Leadership and social influence
Complex problem-solving
Technology design and programming
Emotional intelligence
Reasoning, problem-solving and ideation
Systems analysis and evaluation

Projected use of training providers *(share of training)*

Regional Profile

Central Asia

Factors determining job location decisions

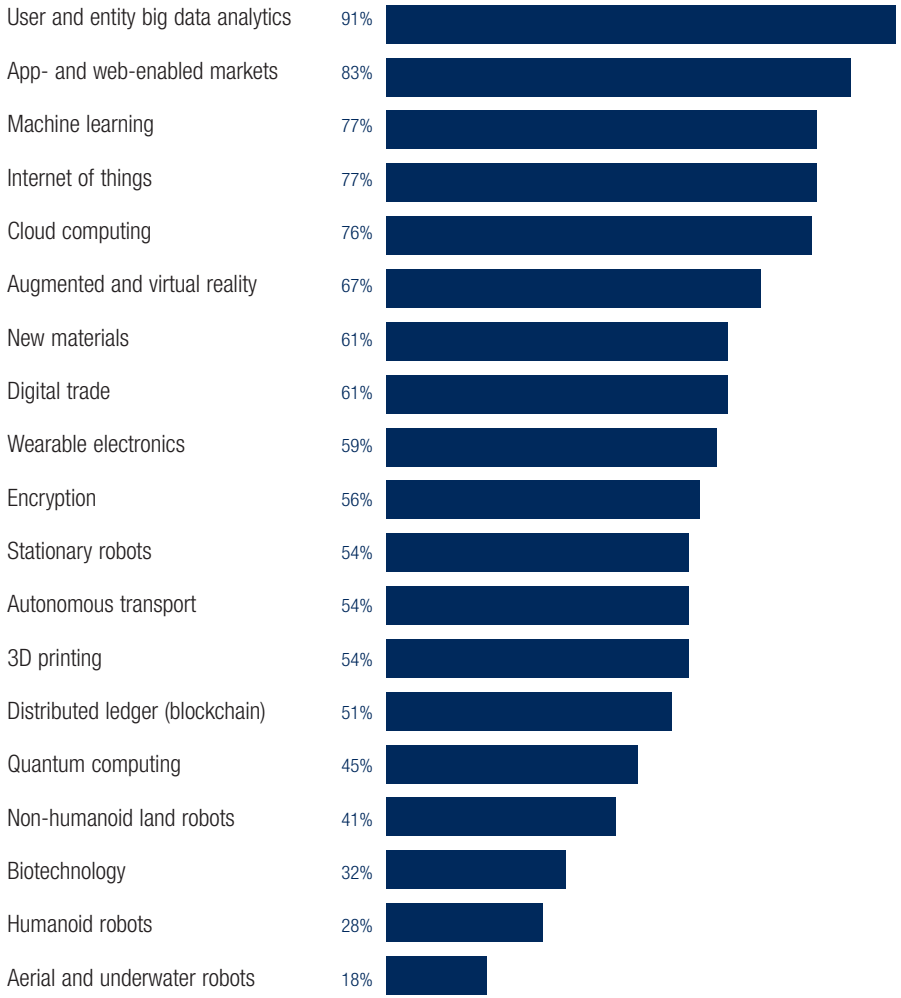
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Labour cost	Production cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Quality of the supply chain	Labour cost
Consumer	Labour cost	Geographic concentration	Talent availability
Energy Utilities & Technologies	Talent availability	Production cost	Labour cost
Financial Services & Investors	Talent availability	Labour cost	Organization HQ
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Organization HQ
Oil & Gas	Production cost	Talent availability	Location of raw materials
Professional Services	Talent availability	Geographic concentration	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Managing Directors and Chief Executives
Software and Applications Developers and Analysts
Sales and Marketing Professionals
Data Analysts and Scientists
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial and Investment Advisers
Assembly and Factory Workers
Financial Analysts

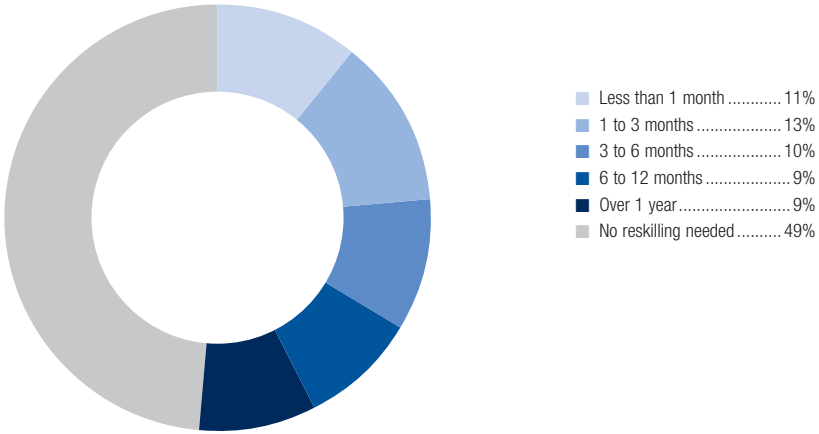
Technology adoption *(share of companies surveyed)*



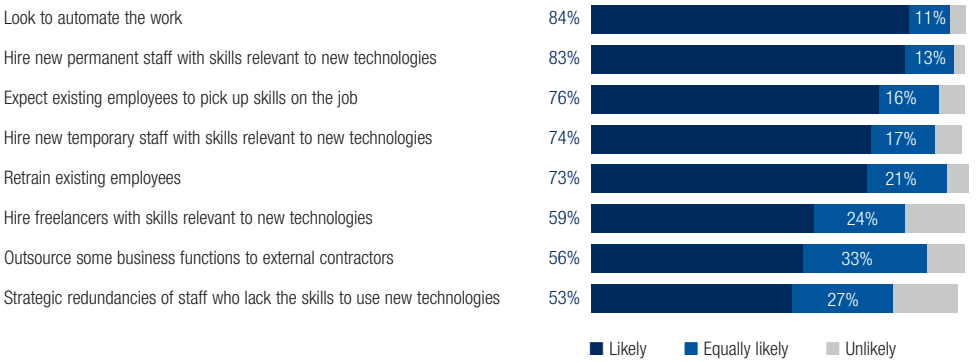
Regional Profile

Central Asia

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Critical thinking and analysis
Emotional intelligence
Complex problem-solving
Leadership and social influence
Reasoning, problem-solving and ideation
Resilience, stress tolerance and flexibility

Projected use of training providers *(share of training)*

Regional Profile

East Asia and the Pacific

Factors determining job location decisions

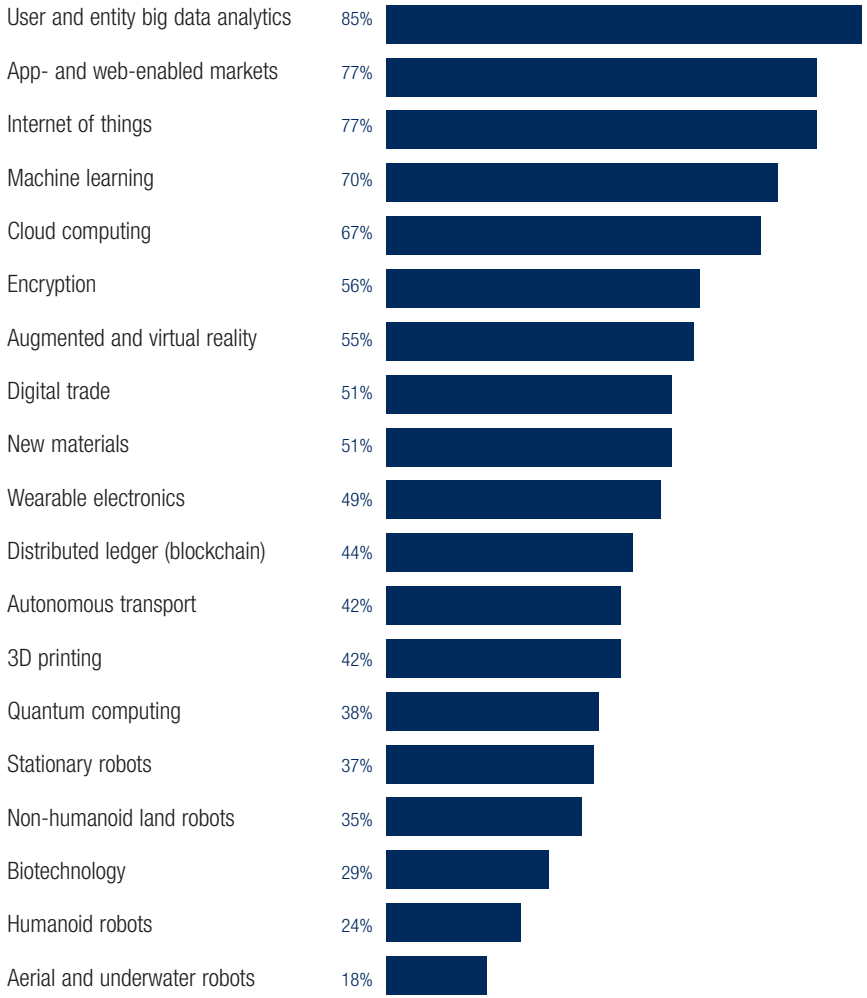
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Labour cost	Quality of the supply chain
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Quality of the supply chain
Consumer	Talent availability	Labour cost	Production cost
Energy Utilities & Technologies	Labour cost	Geographic concentration	Talent availability
Financial Services & Investors	Talent availability	Organization HQ	Geographic concentration
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Infrastructure	Labour cost	Talent availability	Organization HQ
Mining & Metals	Production cost	Labour cost	Quality of the supply chain
Oil & Gas	Talent availability	Production cost	Geographic concentration
Professional Services	Talent availability	Labour cost	Strong local ed. provision

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Data Analysts and Scientists
Sales and Marketing Professionals
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial Analysts
Financial and Investment Advisers
Database and Network Professionals

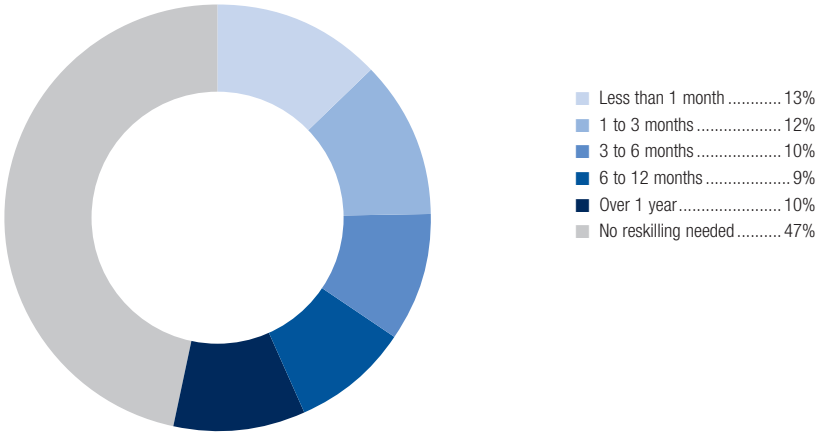
Technology adoption *(share of companies surveyed)*



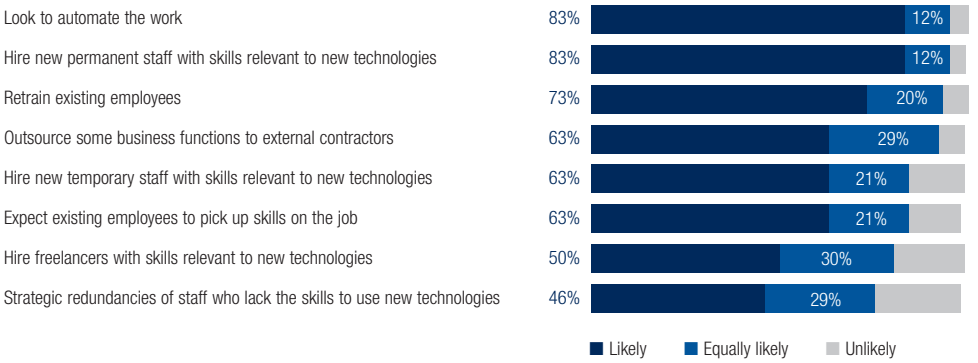
Regional Profile

East Asia and the Pacific

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Active learning and learning strategies
Creativity, originality and initiative
Technology design and programming
Critical thinking and analysis
Complex problem-solving
Systems analysis and evaluation
Leadership and social influence
Emotional intelligence
Reasoning, problem-solving and ideation

Projected use of training providers *(share of training)*

Regional Profile

Eastern Europe

Factors determining job location decisions

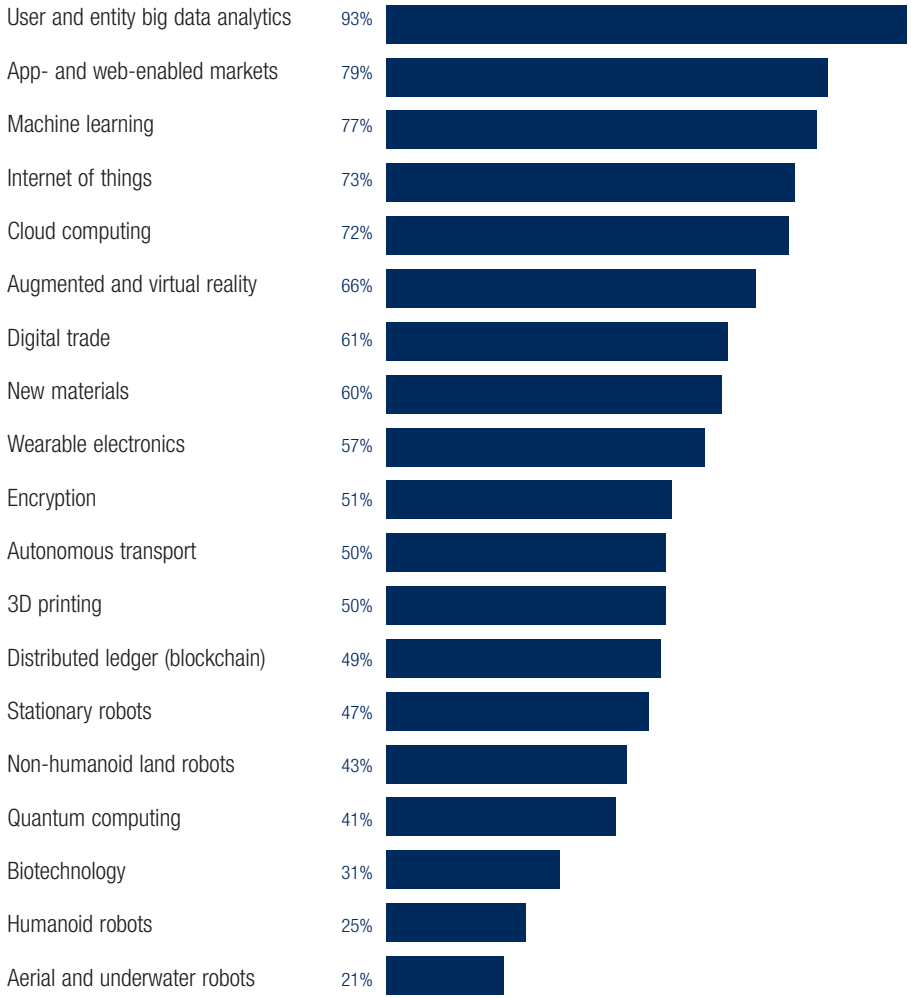
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Production cost	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Labour cost	Talent availability	Production cost
Financial Services & Investors	Talent availability	Labour cost	Organization HQ
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Talent availability	Geographic concentration	Production cost
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Sales and Marketing Professionals
Data Analysts and Scientists
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial Analysts
Assembly and Factory Workers
Information Security Analysts

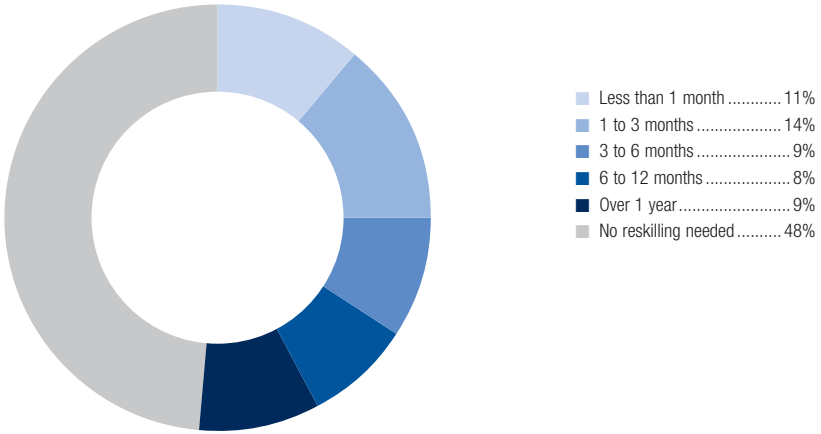
Technology adoption *(share of companies surveyed)*



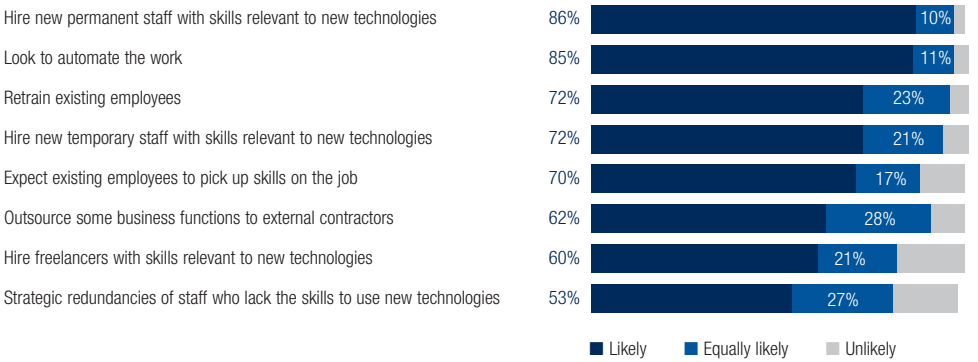
Regional Profile

Eastern Europe

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Creativity, originality and initiative
Analytical thinking and innovation
Active learning and learning strategies
Technology design and programming
Emotional intelligence
Critical thinking and analysis
Leadership and social influence
Complex problem-solving
Systems analysis and evaluation
Reasoning, problem-solving and ideation

Projected use of training providers *(share of training)*

Regional Profile

Latin America and the Caribbean

Factors determining job location decisions

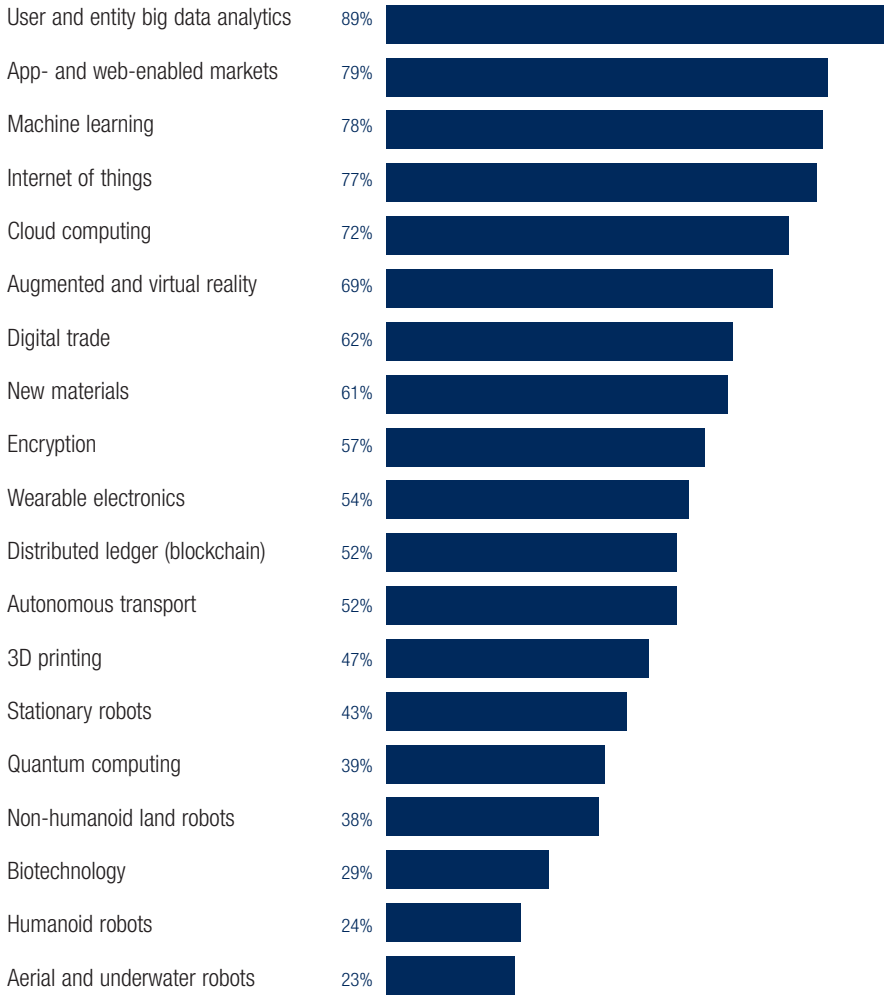
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Labour cost	Geographic concentration
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Quality of the supply chain
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Production cost	Labour cost	Talent availability
Financial Services & Investors	Talent availability	Labour cost	Geographic concentration
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Ease of importing talent
Infrastructure	Talent availability	Organization HQ	Labour cost
Mining & Metals	Production cost	Location of raw materials	Labour cost
Oil & Gas	Talent availability	Production cost	Organization HQ
Professional Services	Talent availability	Labour cost	Geographic concentration

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Data Analysts and Scientists
General and Operations Managers
Sales and Marketing Professionals
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Financial and Investment Advisers
Financial Analysts
Human Resources Specialists
Assembly and Factory Workers

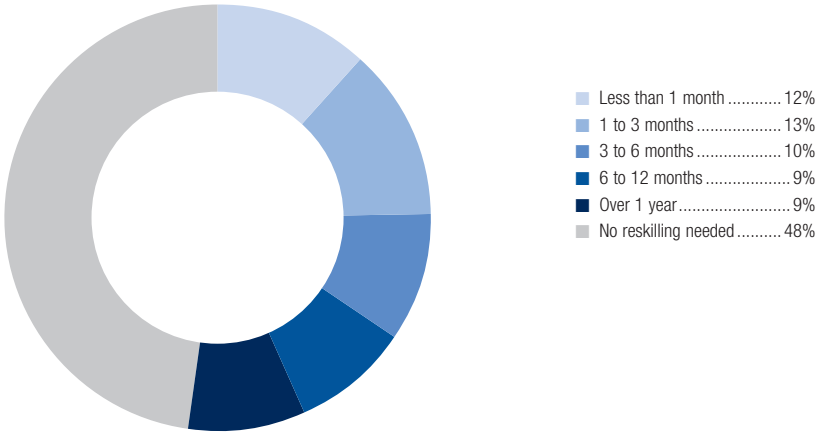
Technology adoption *(share of companies surveyed)*



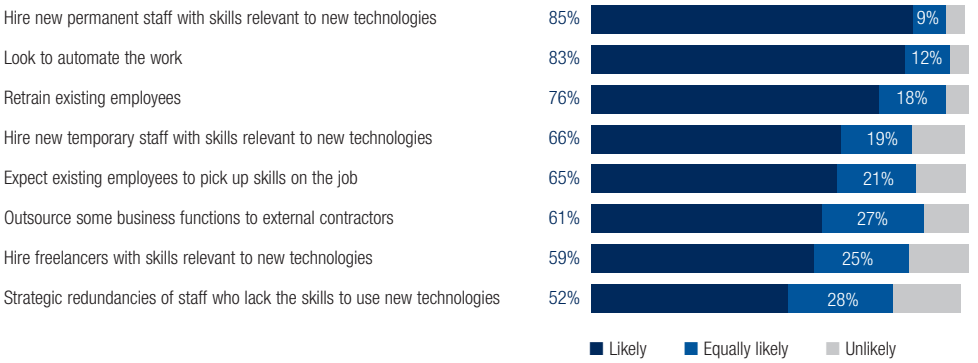
Regional Profile

Latin America and the Caribbean

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Reasoning, problem-solving and ideation
Critical thinking and analysis
Leadership and social influence
Complex problem-solving
Emotional intelligence
Resilience, stress tolerance and flexibility

Projected use of training providers *(share of training)*

Regional Profile

Middle East and North Africa

Factors determining job location decisions

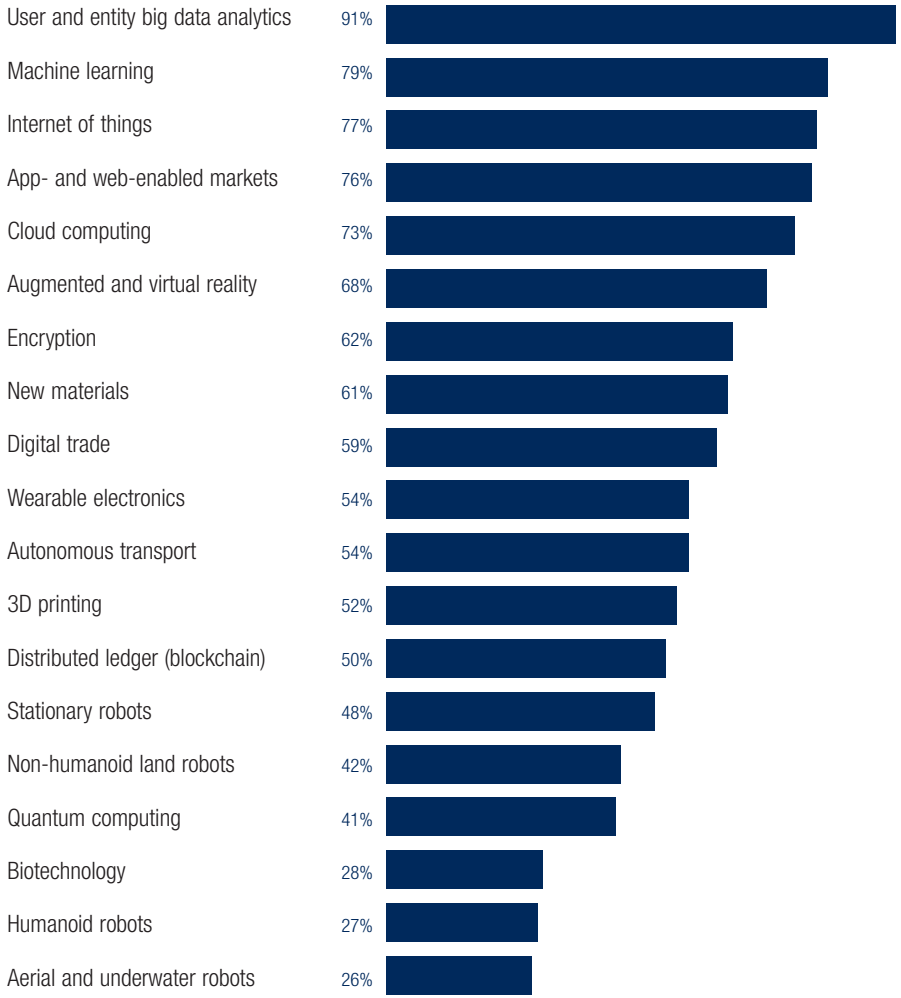
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Production cost	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Quality of the supply chain
Consumer	Labour cost	Talent availability	Quality of the supply chain
Energy Utilities & Technologies	Labour cost	Talent availability	Production cost
Financial Services & Investors	Talent availability	Organization HQ	Labour cost
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Talent availability	Production cost	Location of raw materials
Professional Services	Talent availability	Labour cost	Geographic concentration

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Data Analysts and Scientists
Sales and Marketing Professionals
Managing Directors and Chief Executives
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial Analysts
Assembly and Factory Workers
Financial and Investment Advisers

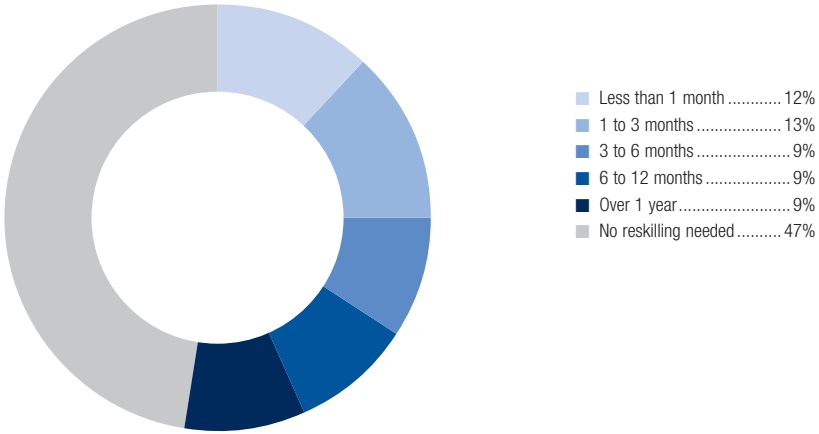
Technology adoption *(share of companies surveyed)*



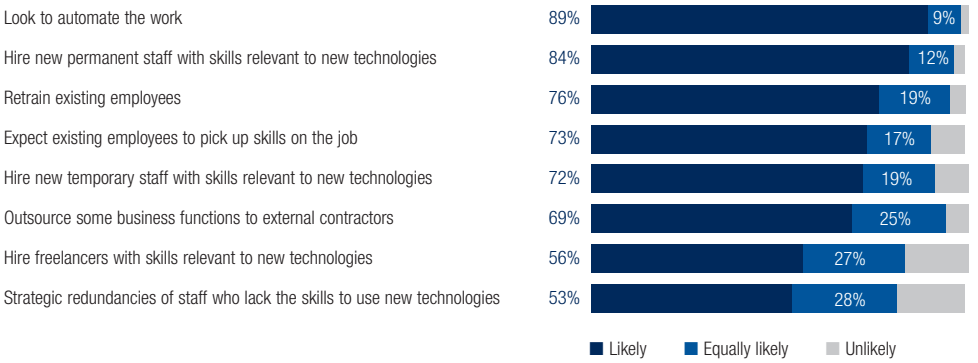
Regional Profile

Middle East and North Africa

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Active learning and learning strategies
Creativity, originality and initiative
Technology design and programming
Complex problem-solving
Leadership and social influence
Critical thinking and analysis
Reasoning, problem-solving and ideation
Emotional intelligence
Systems analysis and evaluation

Projected use of training providers *(share of training)*

Regional Profile

North America

Factors determining job location decisions

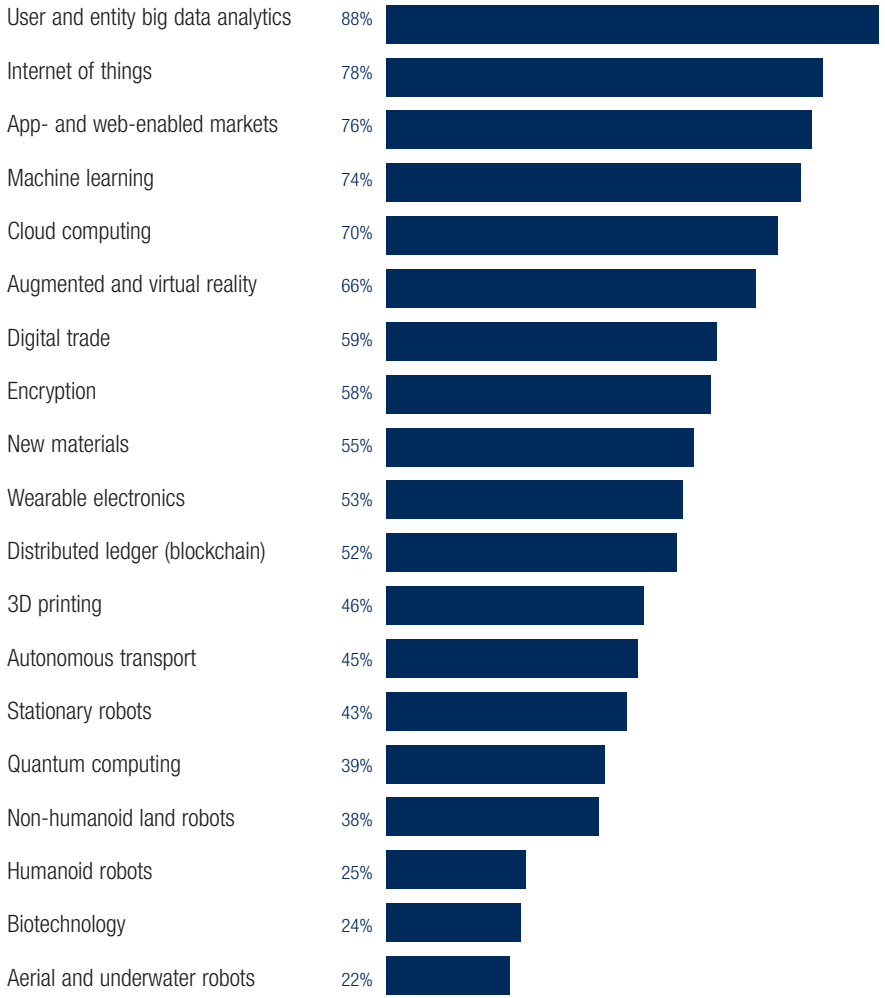
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Talent availability	Labour cost	Quality of the supply chain
Energy Utilities & Technologies	Labour cost	Production cost	Talent availability
Financial Services & Investors	Talent availability	Organization HQ	Geographic concentration
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Infrastructure	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Talent availability	Production cost	Labour cost
Professional Services	Talent availability	Labour cost	Strong local ed. provision

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Data Analysts and Scientists
Managing Directors and Chief Executives
General and Operations Managers
Sales and Marketing Professionals
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial Analysts
Electrotechnology Engineers
Financial and Investment Advisers

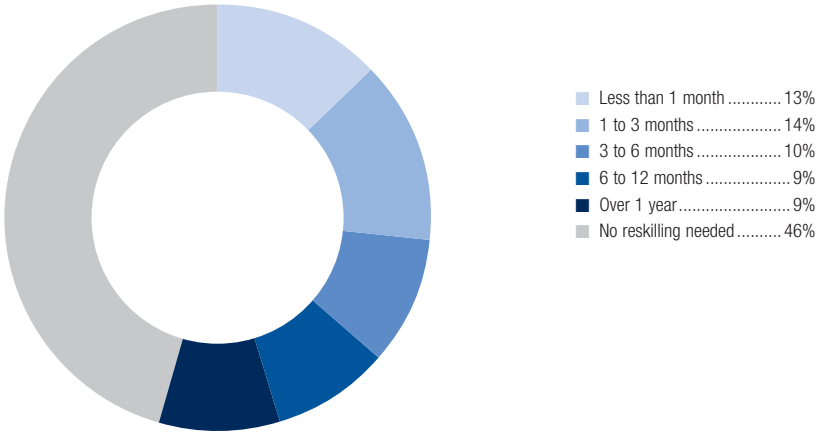
Technology adoption *(share of companies surveyed)*



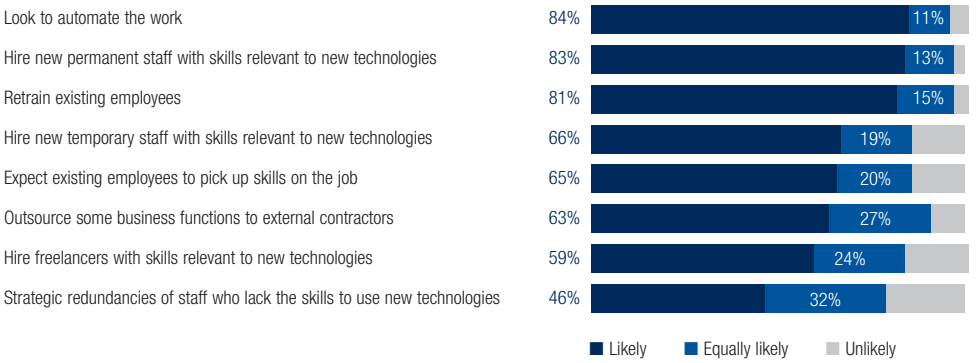
Regional Profile

North America

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Critical thinking and analysis
Complex problem-solving
Leadership and social influence
Reasoning, problem-solving and ideation
Emotional intelligence
Systems analysis and evaluation

Projected use of training providers *(share of training)*

Regional Profile
South Asia

Factors determining job location decisions

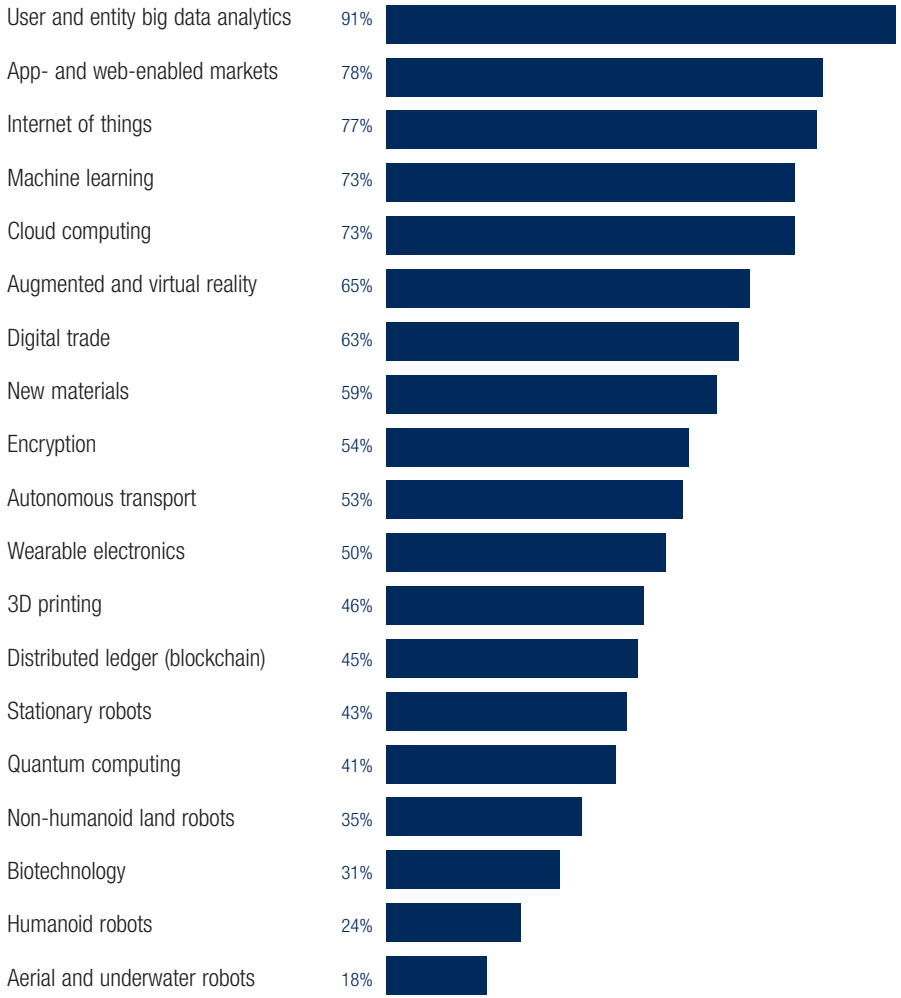
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Production cost	Labour cost
Consumer	Quality of the supply chain	Labour cost	Talent availability
Energy Utilities & Technologies	Talent availability	Organization HQ	Labour cost
Financial Services & Investors	Talent availability	Labour cost	Ease of importing talent
Global Health & Healthcare	Talent availability	Production cost	Labour cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Production cost	Labour cost	Talent availability
Professional Services	Talent availability	Labour cost	Geographic concentration

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Managing Directors and Chief Executives
Sales and Marketing Professionals
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
General and Operations Managers
Software and Applications Developers and Analysts
Data Analysts and Scientists
Human Resources Specialists
Financial and Investment Advisers
Financial Analysts
Assembly and Factory Workers

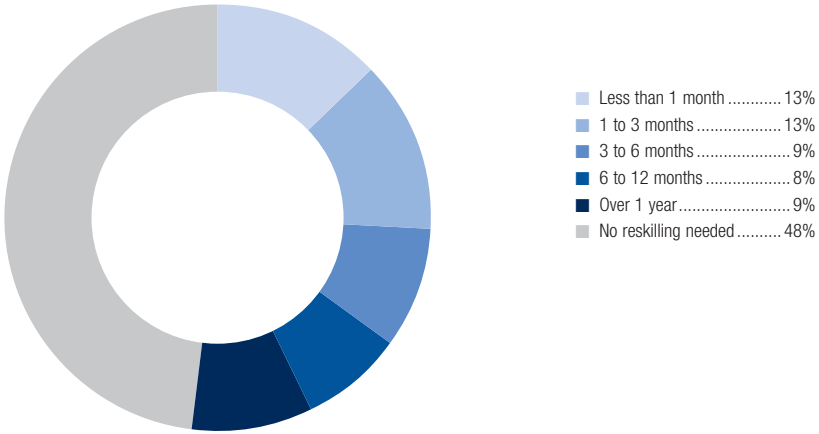
Technology adoption *(share of companies surveyed)*



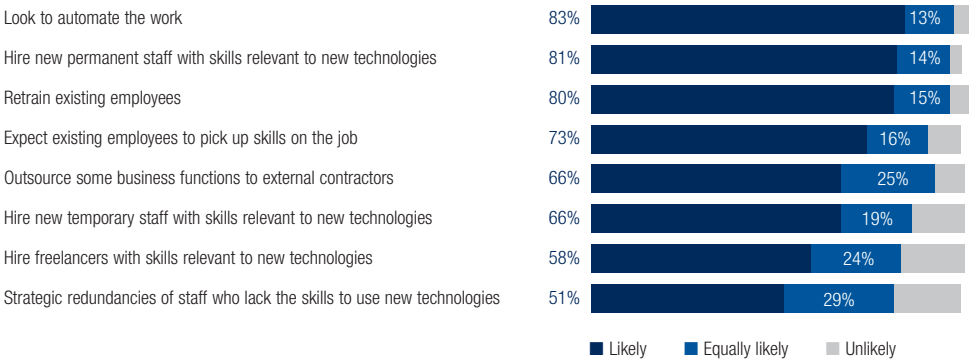
Regional Profile

South Asia

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Active learning and learning strategies
Creativity, originality and initiative
Technology design and programming
Critical thinking and analysis
Complex problem-solving
Leadership and social influence
Emotional intelligence
Reasoning, problem-solving and ideation
Systems analysis and evaluation

Projected use of training providers *(share of training)*

Regional Profile

Sub-Saharan Africa

Factors determining job location decisions

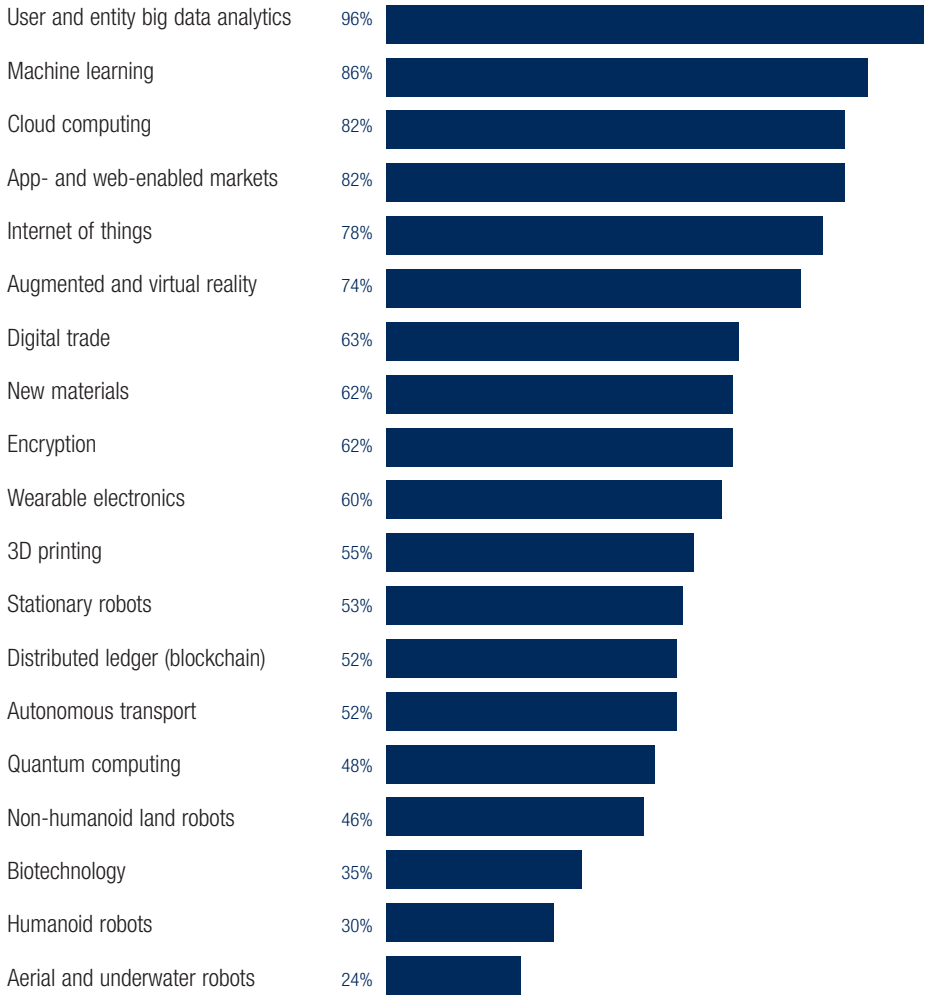
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Production cost	Quality of the supply chain
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Geographic concentration
Consumer	Talent availability	Quality of the supply chain	Labour cost
Energy Utilities & Technologies	Labour cost	Geographic concentration	Talent availability
Financial Services & Investors	Talent availability	Strong local ed. provision	Ease of importing talent
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Ease of importing talent
Oil & Gas	Talent availability	Production cost	Geographic concentration
Professional Services	Talent availability	Geographic concentration	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Sales and Marketing Professionals
Data Analysts and Scientists
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial and Investment Advisers
Assembly and Factory Workers
Electrotechnology Engineers

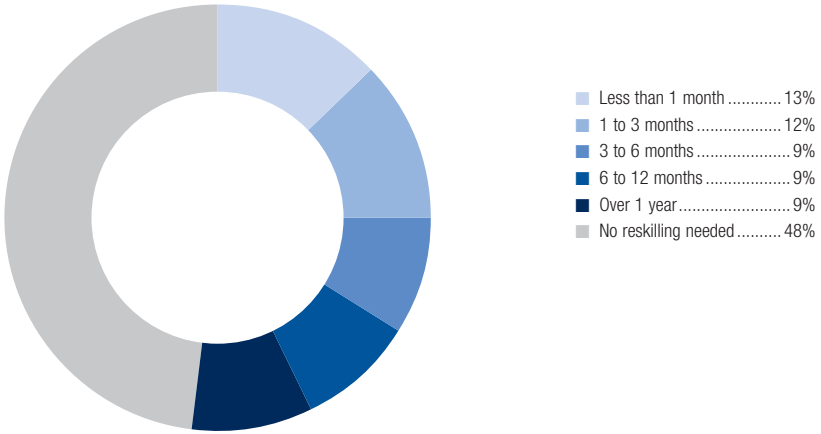
Technology adoption *(share of companies surveyed)*



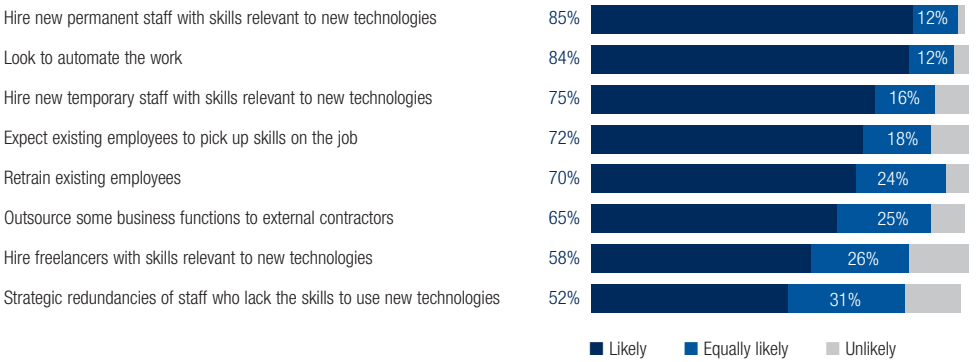
Regional Profile

Sub-Saharan Africa

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Analytical thinking and innovation
Creativity, originality and initiative
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Critical thinking and analysis
Leadership and social influence
Reasoning, problem-solving and ideation
Emotional intelligence
Resilience, stress tolerance and flexibility

Projected use of training providers *(share of training)*

Regional Profile

Western Europe

Factors determining job location decisions

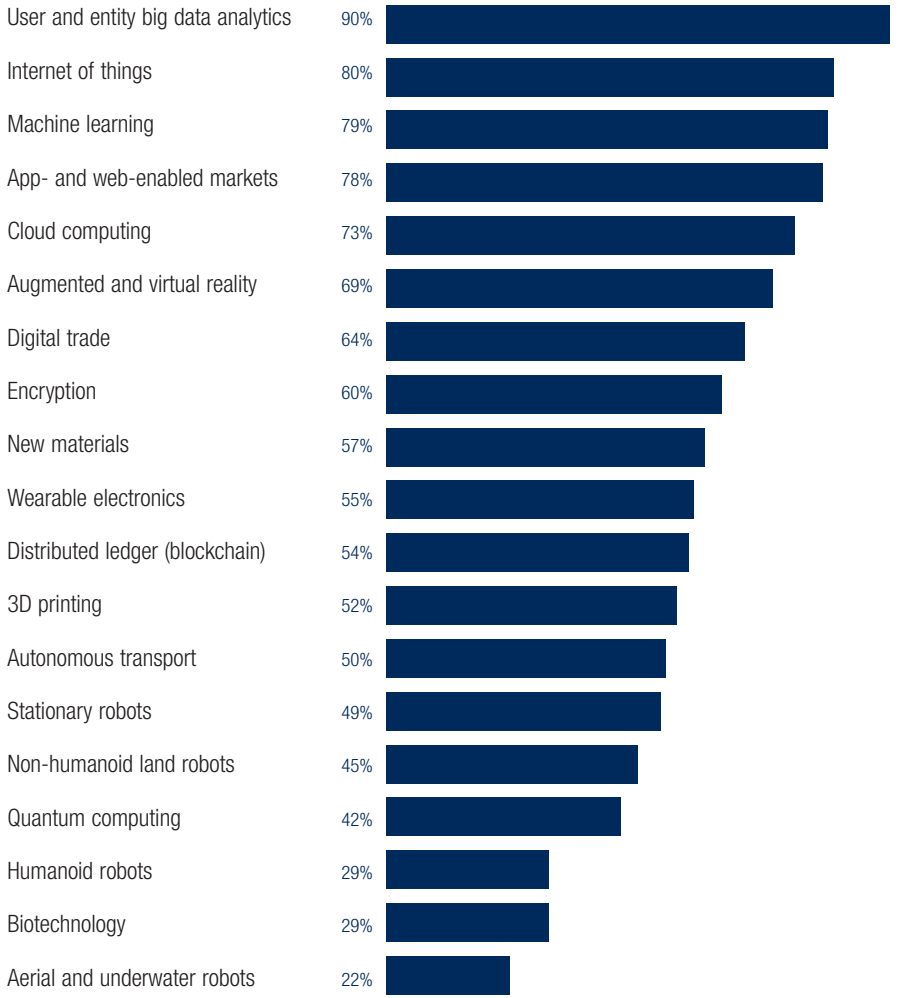
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Production cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Labour cost
Chemistry, Advanced Materials & Biotechnology	Talent availability	Production cost	Labour cost
Consumer	Talent availability	Quality of the supply chain	Production cost
Energy Utilities & Technologies	Talent availability	Labour cost	Production cost
Financial Services & Investors	Talent availability	Organization HQ	Labour cost
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Organization HQ
Oil & Gas	Geographic concentration	Talent availability	Production cost
Professional Services	Talent availability	Strong local ed. provision	Geographic concentration

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts
Managing Directors and Chief Executives
Sales and Marketing Professionals
Data Analysts and Scientists
General and Operations Managers
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Human Resources Specialists
Financial and Investment Advisers
Financial Analysts
Assembly and Factory Workers

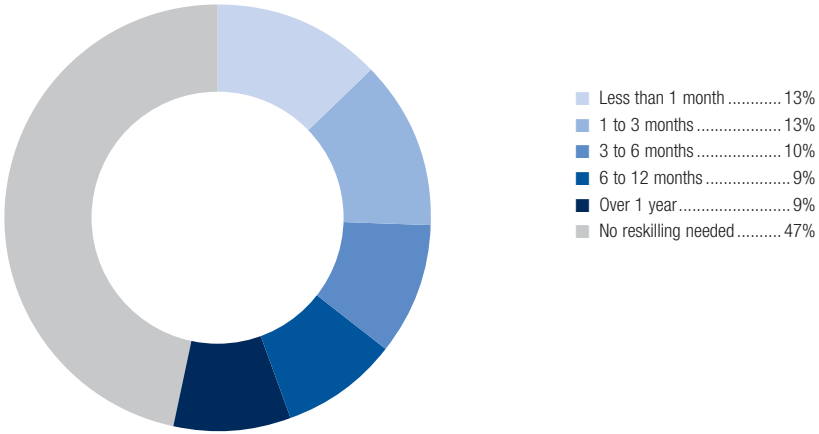
Technology adoption *(share of companies surveyed)*



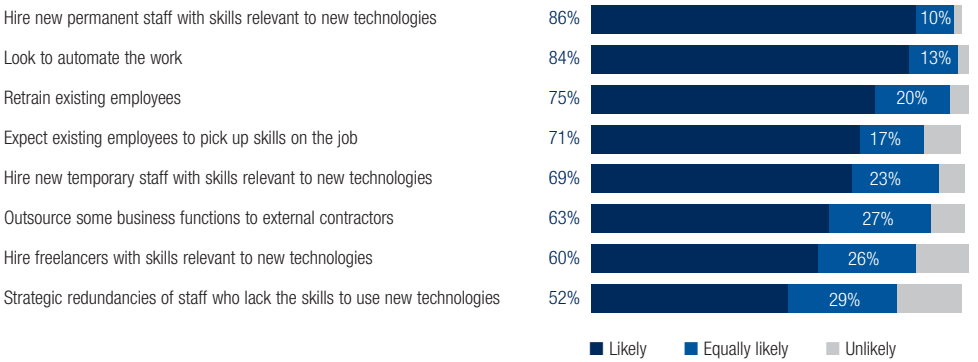
Regional Profile

Western Europe

Average reskilling needs *(share of workforce)*



Responses to shifting skills needs *(share of companies surveyed)*



Emerging skills

Creativity, originality and initiative
Analytical thinking and innovation
Active learning and learning strategies
Technology design and programming
Complex problem-solving
Critical thinking and analysis
Leadership and social influence
Emotional intelligence
Systems analysis and evaluation
Reasoning, problem-solving and ideation

Projected use of training providers *(share of training)*

Contributors

Till Alexander Leopold is a Project Lead in the World Economic Forum's Centre for the New Economy and Society. His responsibilities include co-leadership of the insights workstream of the System Initiative on Education, Gender and Work; co-authorship of the Forum's *Global Gender Gap Report*, *Global Human Capital Report*, *Future of Jobs Report* and *Industry Gender Gap Report*; and management of the Forum's Global Future Council on Education, Gender and Work. He has presented the System Initiative's insights work at a number of high-level events and in the media, and has co-organized activities at the World Economic Forum's Annual Meeting and regional summits. Till previously served as an economist and project manager at the United Nations and International Labour Organization, where his work focused on policy analysis, research and technical cooperation in the fields of entrepreneurship, labour economics, and innovation ecosystems, and as a consultant and analyst in the fields of impact investing and social entrepreneurship, with first-hand research and consulting experience in Sub-Saharan Africa and South Asia. He holds master's degrees in Social Anthropology and Finance and Development Economics from the University of Cambridge and SOAS (University of London), and is currently pursuing a PhD at the United Nations University—Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT).

Vesselina Ratcheva is a Data Lead in the World Economic Forum's Centre for the New Economy and Society. Her responsibilities include co-leading the insights workstream of the System Initiative on Education, Gender and Work, with a particular focus on data and innovation in that domain. Ratcheva is a co-author of the Forum's *Global Gender Gap Report*, *Global Human Capital Report*, *Future of Jobs Report* and *Industry Gender Gap Report*, and in the past has led and collaborated on research projects spanning topics such as skills, identity (gender, ethnic), organizational culture, political mobilization and international migration. Ratcheva has consistently employed quantitative and qualitative research methods in endeavours aimed at finding the best ways to ensure more just social and political systems. Ratcheva previously led on research and evaluation in skills and has specialized on the Balkan region. She holds a PhD in Social Anthropology and an MSc in Comparative and Cross-Cultural Research Methods from Sussex University, and a BA in Social Anthropology and Mathematics from the University of Cambridge.

Saadia Zahidi is a Member of the Managing Board and Head of the Centre for the New Economy and Society at the World Economic Forum. Through the System Initiative on Economic Progress and the System Initiative on Education, Gender and Work, her teams work with leaders from business, government, civil society and academia to understand and shape the new economy, advance competitiveness, drive social mobility and inclusion, close skills gaps, prepare for the future of work and foster gender equality and diversity. Saadia founded and co-authors the Forum's *Future of Jobs Report, Global Gender Gap Report,* and *Global Human Capital Report.* Her book, *Fifty Million Rising,* charts the rise of working women in the Muslim world and is longlisted for the FT/McKinsey Business Book of the Year 2018. She has been selected as one of the BBC's 100 Women and won the inaugural FT/McKinsey Bracken Bower Prize for prospective authors under 35. She holds a BA in Economics from Smith College, an MPhil in International Economics from the Graduate Institute of Geneva and an MPA from the Harvard Kennedy School. Her interests include the future of work, the impact of technology on employment, education and skills gaps, income inequality and using big data for public good.

System Initiative Partners

The World Economic Forum would like to thank the Partners of the System Initiative on Shaping the Future of Education, Gender and Work for their guidance and support to the System Initiative and this report.

- A.T. Kearney
- AARP
- Accenture
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- African Rainbow Minerals
- Alghanim Industries
- AlixPartners
- AT&T
- Bahrain Economic Development Board
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- JD.com
- JLL
- Lego Foundation
- LinkedIn
- LRN Corporation
- ManpowerGroup
- Mercer (MMC)
- Microsoft Corporation
- Nestlé
- Nokia Corporation
- NYSE
- Omnicom Group
- Ooredoo
- PayPal
- Pearson
- PhosAgro
- Prince Mohammed bin Salman bin Abdulaziz (MiSK) Foundation
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- Publicis Group
- PwC
- QI Group
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- Salesforce
- SAP
- Saudi Aramco
- SeverGroup
- Tata Consultancy Services
- The Rockefeller Foundation
- Turkcell
- UBS
- Unilever
- VMware
- Willis Towers Watson
- Workday
- WPP

In addition to our Partners, the leadership of the System Initiative on Shaping the Future of Education, Gender and Work includes leading representatives of the following organizations: Council of Women World Leaders; Department for Planning, Monitoring and Evaluation of the Presidency of South Africa; Endeavor; Haas School of Business, University of California, Berkeley; International Finance Corporation (IFC); International Labour Organization (ILO); International Trade Union Confederation (ITUC); JA Worldwide; London Business School; Ministry of Education of the Government of Singapore; Ministry of Employment of the Government of Denmark; Ministry of Employment, Workforce Development and Labour of the Government of Canada; MIT Initiative on the Digital Economy; Office of the Chief of the Cabinet of Ministers of Argentina; Office of the Deputy Prime Minister of the Russian Federation; The Wharton School, University of Pennsylvania; and United Way Worldwide.

To learn more about the System Initiative, please refer to the System Initiative website: https://www.weforum.org/system-initiatives/shaping-the-future-of-education-gender-and-work.

Survey Partners

The *Future of Jobs Report 2018* is the result of extensive collaboration between the World Economic Forum and its constituents, amplified by key regional survey partners. We would like to recognize the following organizations for their contribution to the World Economic Forum's Future of Jobs Survey and this report.

INDIA

Confederation of Indian Industry (CII)
Observer Research Foundation (ORF)

SOUTH AFRICA

Business Leadership South Africa

REPUBLIC OF KOREA

Korean Development Institute (KDI)

SWITZERLAND

EconomieSuisse

LATIN AMERICA

Inter-American Development Bank (IDB)

UNITED KINGDOM

Confederation of British Industry (CBI)

RUSSIAN FEDERATION

Eurasia Competitiveness Institute (ECI)

VIETNAM

Ministry of Labour, Invalids and Social Affairs

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Data Lead, Centre for the New Economy and Society

Saadia Zahidi
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Member of the Managing Board

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بسم الله الرحمن الرحيم

مدرسه تعالی رویای آینده

وابسته به اندیشکده صنعت و فناوری (آصف)

شعبه تهران (مرکزی): خیابان مفتح، خیابان کوه نور، کوچه ششم، شماره ۱۴، واحد ۱۱

شعبه مشهد مقدس: بلوار معلم، بین معلم ۴۳ و ۴۵، ساختمان ۶۴۹، طبقه ۳، واحد ۵

شعبه گرگان: خیابان ملاقاتی، ملاقاتی ۱۰، شماره ۷

شعبه قزوین: بلوار شهیدبهشتی، ساختمان حافظ، طبقه ۲

نشانی اینترنتی: asefacademy.ir

در طول تاریخ مشاغل و حرفه‌هایی ناپدید و در عوض مشاغل جدیدی در بازار کار جایگزین آن‌ها شده‌اند. برای مثال دیگر نیازی به روشن‌کننده لامپ‌های گازی در خیابان‌ها وجود ندارد. برخی مشاغل تکامل یافتند که به‌عنوان نمونه می‌توان کشیدن دندان را نام برد. صاحبان این شغل اکنون با عنوانی چون دندان‌پزشک به جامعه خدمت می‌کنند. مشاغلی نظیر توزیع شیر، روزنامه و یا تهیه پرینت نیز رو به افول گذاشته‌اند. در کنار مشاغل رو به افول، مشاغل جدیدی مانند طراحی وب، ورزش حرفه‌ای، مشاوره رسانه‌ای و زیست‌فناوری وجود دارند که تا چند سال پیش حتی نامی از آن‌ها نبود. آینده نیز با چنین تغییراتی روبرو خواهد بود و انتظار می‌رود در حوزه‌هایی مانند فناوری اطلاعات، انرژی‌های جایگزین و تجارت جهانی مشاغل نوینی ظهور کنند.

برای هر فردی که خواهان موفقیت شغلی است، آینده ارزشمند است، چرا که فرد می‌تواند از امروز با انتخاب مسیر شغلی مناسب، پیشرفت شغلی خویش در آینده را تسهیل کند و همچنین امنیت شغلی وی کمتر به مخاطره خواهد افتاد. بر همین اساس مراکزی در جهان به دنبال پیش‌بینی آینده مشاغل هستند و به شکلی مستمر گزارش‌هایی در این زمینه ارائه می‌کنند.

فهرست مشاغل زیر بر اساس مطالعات اندیشکده آصف تهیه شده است. این فهرست بر اساس حوزه‌های مختلف دسته‌بندی شده و در هر حوزه مشاغل آینده را معرفی کرده است. مشاغل موجود در این فهرست بر پیش‌بینی‌های انجام‌شده تا افق ۲۰۳۰ استوار هستند. برخی از این مشاغل هم‌اکنون نیز وجود دارند و در آینده با تقاضای بیشتری همراه خواهند بود. این‌گونه مشاغل از نظر نیازهای شغلی و حرفه‌ای در رو به رشد هستند. برخی نیز کاملاً جدید خواهند بود.

اندیشکده آصف

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۱۳ ..... ć¿½ÿwÊ í
۱۴ ..... ćÁ¾ýv ã¾Ċ · » ÿ ºĊòÃ£
۱۵ ..... ÿ¾Ċý ¢ĉ¾ĉºù ÿ ç¾z Üĉ¿Ã£ ćwĂÎ{É
۱۶ ..... ć vã¹w« ôêýÿôú³
۱۷ ..... Êzj ôêýÿôú³
۱۸ ..... wÒå
۱۹ ..... ÊýºÞù Üzwþù ć½ÿv¾å ÿ ćÿwíûºÞù
۲۰ ..... ćÁ½Ãôw¤ù
۲۰ ..... ć½ÿwþßÃýwý ÿ Ă¤å¾Ê Ċ~ ¹vÃù
۲۱ ..... ì Ċ£wz½ ÿ ì Ċýwîù Ã ºþAù
۲۲ ..... ì {Å ¢Þþ Í
۲۳ ..... ûwí¹Ãí ¡ wùº · ÿ ¡ đÄ Î ´ ù
۲۴ ..... ¡ wÝĒÕv ć½ÿwþå È ¸z
۲۵ ..... Ê ôwù ½Ãùv
۲۶ ..... ¢ ĉ¾ĉºù
۲۸ ..... ÊÝwú¤«v È ¸z

¢ ÉvºAz ÿ ÊîÉÀ~ ÷ÃöÝ ã¿Ã³

بهداشت همواره بخشی حیاتی در زندگی بشر بوده است و اهمیت آن در آینده نیز افزایش خواهد یافت. حتی امروزه شاهد رشد امید به زندگی در جوامع مختلف هستیم که به معنای افزایش توجه به‌سلامت انسان، از بدو تولد تا پایان عمر، است. مشاغلی که در این حوزه برای سال‌های آینده پیش‌بینی می‌شوند عبارت‌اند از:

۱. 5#Medical data manager$ ÊîÉÀ~ ćwăã¹v¹ ¢ ĉ¾ĉºù فردی متخصص در حوزه فناوری اطلاعات، ایجاد و مدیریت پایگاه داده‌های فیزیولوژیک و تولیدکننده نرم‌افزار برای تجهیزات درمانی و تشخیصی که با تحولات بزرگ در حوزه جمع‌آوری و تحلیل داده‌های پزشکی هیچ‌گاه بیکار نخواهد ماند.

۲. 5#Medical equipment designer$ ÊîÉÀ~ ¡ vÀĊĄ¬£ ±v¾Õ فردی متخصص در طراحی و گرافیک کامپیوتری، علم مواد، مقاومت مصالح، اجزای ماشین و قطعات الکتریکی با توانایی در تجسم فضایی که درک خوبی از آناتومی و فیزیولوژی بدن انسان دارد و با زیست سازگاری مواد و تجهیزات آشناست. این فرد در زمینه ایمنی پزشکی و فنی نیز تخصص دارد.

۳. 5#Medical institution life cycledesigner$ ÊîÉÀ~ ćwă¹wAý ¾úÝ Ă·¾¯ ±v¾Õ فردی حرفه‌ای که در زمینه طراحی چرخه عمر نهادهای پزشکی و یا مدیریت آن فعالیت خواهد کرد. امروزه بیمارستان‌ها تنها نهادهای تأمین‌کننده طیف معینی از خدمات پزشکی نیستند و فعالیت‌هایی نظیر تحقیق و توسعه، آموزش، تربیت نیروی انسانی و خبرگی در فناوری‌های نوین در توسعه نهادهای پزشکی نقش رو به اهمیت بیشتری را ایفا می‌کنند. مدیریت نظام‌های پیچیده این‌چنینی به افراد متخصص نیاز دارد.

۴. 5#Medical marketing expert$ ÊîÉÀ~ Ĉzwĉ½v¿wz Ì Î ¸ ¤ù متخصص پژوهش بازار در زمینه‌های داروسازی، خدمات پزشکی و تجهیزات پزشکی که وظیفه طراحی سیاست‌های بازار برای شرکت‌ها و مراکز تحقیقاتی را بر عهده دارد. این شغل از گذشته وجود داشته است، اما به‌تدریج اهمیت آن رو به افزایش خواهد گذاشت.

۵. 5#Medical robot operator$ ÊîÉÀ~ ćwă ¡ wz½ ½Ã£v¾~v فردی متخصص در برنامه‌ریزی ربات‌های تشخیص‌دهنده، درمانگر و جراح است. اگرچه توسعه ربات‌های جراح از اوایل دهه ۱۹۸۰ آغازشده است، اما این حوزه به‌شدت رو به رشد است.

۶. 5#Molecular nutrition expert$ ÊöÃîöÃù Ăĉ¼â£ Ì Î ¸ ¤ù فردی متخصص طراحی رژیم‌های غذایی خاص بر اساس تحلیل غذاها در سطح مولکولی که نتایج حاصل از تحلیل ژنتیکی بیمار را در نظر گرفته و فرایندهای فیزیولوژیک آن‌ها را مشخص می‌کند.

۷. 5#Old-age health consultant$ đwz üĊþÅ ćv¾z ¢ ùĒÅ ½ÿwÊù متخصص امور پزشکی و اجتماعی که وظیفه توسعه راه‌حل‌های متوازن برای رفع مشکلات مرتبط با مسن شدن جمعیت را بر عهده دارد.

۸. 5#Online doctor$ üĉĒýj ì ÉÀ~ متخصص تشخیص بیماری سطح بالا، آشنا با فناوری‌های اطلاعات و ارتباطات که قادر به تشخیص بیماری‌ها به‌صورت آنلاین است. این متخصصان ممکن است در مراکز عمده چک آپ پزشکی از راه دور مشغول به کار باشند یا پشتیبانی لازم از مراکز داده را برای پردازش اطلاعات اخذشده از پرتال‌های سلامتی یا ابزار پزشکی شخصی بر عهده داشته باشند.

۹. 5#Personalized healthcare expert$ ć¹¾å ¢ ÉvºAz Ì Î ¸ ¤ù این فرد با مطالعه وضعیت ژنتیکی بیمار برنامه‌های درمانی مناسب (تشخیص، پیشگیری و درمان) را طراحی کرده و محصولات بیمه پزشکی مربوطه را ارائه می کن:. تغییرات منطقی مستمر به‌سوی رویکرد درمانی مناسب. تحلیل اساسی ژنتیک و پیش‌بینی توانمندی‌ها جلوگیری از وقوع بسیاری از بیماری‌ها قبل از نیاز به درمان محقق خواهد ساخت.

۱۰. 5#R&D manager in healthcare$ ¢ ùĒÅ ĂÞÅÃ£ ÿ èĊê´£ ¢ ĉ¾ĉºù متخصصی که ارتباط میان تحقیق، تشخیص، درمان و پیشگیری را فراهم می‌آورد و برنامه‌های همکاری و پروژه‌های مشترک را مدیریت می‌کند. در کنار هم قرار دادن تیمی از

دانشمندان، مهندسان، پژوهشگران و طراحان و متمرکز ساختن آن‌ها بر محقق ساختن ایده‌های سودآور بالقوه و هماهنگ‌سازی میان کل فرایند اشتراکی وظیفه اوست.

۱۱. Õ¾v± ċúü þ¢ ÿ ~¾ÿ£ÀăwĆ ½zwČ ì $Robotic prosthesis and implant designer#5 توسعه ابزار کارکردی مصنوعی (پروتزهای رباتیک) و اندام‌های سازگار با چینی‌جاهای زنده وظیفه این متخصص است. این حوزه در آینده رشد سریعی خواهد داشت و شبیه‌ساز عضله الکتریکی ایمپلنت نمونه‌ای از کارهای این تخصص است.

۱۲. ùĄþº Ã zwå ¢ $Tissue engineer#5 طراحی حرفه‌ای فرایند فناورانه و انتخاب مواد و شرایط برای تشکیل یک بافت یا ارگان خاص از وظایف این تخصص است. جراحان پیوند اعضا از نتایج کار این تخصص بهره خواهند برد.

۱۳. ùº ¸ Î Ì v· Ēç ¿ĉÆ¤Ĉ $Bioethicist#5 متخصصی که چهارچوب اخلاقی و قانونی را برای مراکز پزشکی، تشخیصی و زیست مهندسی درگیر در مدل‌سازی ژنتیک و پیوند اعضا فراهم می‌آورد. هیچ آزمایشگاه پیشرفته‌ای، به‌ویژه در حوزه کلونینگ بافت، بدون دریافت مشاوره از چنین متخصصی مدیریت نخواهد شد.

۱۴. ¿ĉÆ ¢ vÕĒÝw ¡ ĉw zĈĀwýæĀ½ùwĈ ì $Bioinformatician#5 متخصص این حوزه در صورت وقوع غیرمعمول نوعی بیماری، به شبیه‌سازی کامپیوتری فرایندهای بیوشیمیایی بیماری خواهد پرداخت تا به درک علل اصلی آن کمک کند (کشف بی‌نظمی‌ها در سطح سلولی و زیرسلولی). این تخصص اگرچه مدتی است مور استفاده قرار می‌گیرد اما در آینده کاربرد بسیار بیشتری خواهد یافت.

۱۵. ùº ¸ Î Ì Áû¹½ùwýĈ $Gene therapy expert#5 فرد متخصص در برنامه‌ریزی ژنوم برای پارامترهای از پیش تعیین‌شده که از تغییرات ژنتیک انسانی برای مبارزه با بیماری کمک می‌گیرد. این تخصص در دهه گذشته رشد چشمگیری داشته است. تاکنون آزمایش‌های بیشتر بر روی حیوانات انجام‌شده است اما نمونه‌های موفقی از کاربرد روش بر روی انسان‌ها نیز وجود دارد. این گام اول است و گام بعدی اصلاح ژنوم خواهد بود.

۱۶. ùÊwÿ½ã Áýĉî Ĉ $Genetic consultant#5 متخصص این حوزه هدایت تحلیل‌های ژنتیکی در مراکز تشخیصی، پردازش داده‌های اخذشده از دستگاه‌های تشخیصی و ارائه پیشنهادها و توصیه‌های درمانی را بر عهده دارد. تحلیل ژنتیکی این متخصص شناسایی مارکرهای سرطانی، تشخیص بیماری‌های ارثی، تعیین ویژگی‌های متابولیسم بیمار و مطالعه بیماری‌های ناشی از باکتری‌های عفونت‌زا را ممکن می‌سازد. این مراحل در حال حاضر در حال انجام است و در آینده گسترش بیشتری خواهد یافت.

Åw· ¢ ÿÅw¿

ساخت‌وساز یکی از زیرساخت‌های حیاتی آینده است که مسئولیت توسعه اقتصادی و آسایش روزانه مردم را بر عهده دارد. این صنعت یکی از پیشتازان ایجادکننده مشاغل در دنیا خواهد بود. الزام‌های ساخت‌وساز مدرن منجر به تحولی گسترده در این صنعت خواهد شد. مشاغل مهم آینده در این حوزه عبارت‌اند از:

۱. Õ¾v± ~¾ĉþ ¢ ÅĂzþº ć ¹½ ³Ã¿ã Åw· ¢ ÿÅw¿ $3D PRINTING DESIGNER IN CONSTRUCTION#5 این متخصص طراحی مدل‌های ساختمانی را انجام می‌دهد و بهترین مجموعه اجزا را برای پرینت آن‌ها انتخاب می‌کند. پشتیبانی از فرایند پرینت سه‌بعدی ساختمان از دیگر وظایف این تخصص است

۲. Õ¾v³ Ĉù ´ĈÔ éwzõ¹Å¤¾ÅĈ $ACCESSIBLE ENVIRONMENT DESIGNER#5 متخصص در توسعه راه‌حل‌های زیربنایی برای ایجاد فضای مناسب کودکان، افراد مهم و اشخاص معلول (نظیر زمین بازی، آسانسور مخصوص معلولین، علائم مخصوص برای افراد دارای مشکل بینایی، سطوح شیب‌دار، فضاهای تفریحی و غیره) در اطراف ساختمان‌ها و املاک.

۳. Õ¾v± ÿ ùºĉ¾ ùºóÅw¿ć vÕĒÝw ¡ Åw·¤úwû $Building Information Modeling MANAGER DESIGNER#5 افراد دارای این تخصص در کل چرخه عمر پروژه‌های ساختمانی درگیر خواهند بود. مدل‌سازی اطلاعات ساختمان به معنای جمع‌آوری و

پردازش جامع کل داده‌های اقتصادی، معماری، ساختمانی، فناورانه و سایر داده‌های مربوط به یک ساختمان به همراه ارتباط میان آن‌ها، در نوعی طراحی خاص است که ساختمان و کلیه داده‌های مربوط به آن را به شکلی منفرد در برگیرد.

۴. 5#CONSTRUCTION TECHNOLOGY UPGRADE SPECIALIST$ Ĉýwú¤·wÅ ć½ÿwþåwê£½v Ì Î ¸¤ù فرد شاغل در این حرفه به‌خوبی با فناوری‌های پیشرفته ساخت‌وساز آشناست. به‌عنوان نمونه می‌توان از سازه‌های ساخته‌شده از مواد پیشرفته که برای ارتقای ساختمان‌های موجود به کار می‌روند، به‌کارگیری راه‌حل‌های پیشرفته برای تأمین آب و برق، دستگاه‌های تخلیه آب و تهویه هوا در دفاتر اداری و ساختمان‌های مسکونی نام برد. ترویج این فناوری‌ها در صنعت و اجرای آن‌ها در پروژه‌های خاص از دیگر وظایف این فرد است.

۵. 5#ENVIRONMENTAL ANALYST IN CONSTRUCTION$ ¿wÅÿ¢·wÅ ā¿Ā³ ½¹ ĈÖĊ´ù¢Æĉ¿ ½Āùv ¾òöĊö´£ متخصصی که محل ساخت‌وساز را بر اساس تأثیرات زیست‌محیطی آن طراحی می‌کند و به شرکت‌ها درباره راه‌حل‌هایی با کمترین خسارات زیست‌محیطی مشاوره می‌دهد.

۶. 5#FOREMAN WATCHER$ ¾ñ½wí¾Å ¾Ùwý متخصص ساخت ساز با توانایی استفاده از طراحی‌های دیجیتالی سازه که می‌تواند از دستگاه‌های تشخیص تصویر برای ارزیابی میزان پیشرفت ساختمان‌سازی استفاده کند و پیشرفت کارها را بر اساس تحلیل داده‌ها تنظیم کند.

۷. 5#SMART HOUSE INFRASTRUCTURE DESIGNER$ °þúÉĀă ćwăĂýw· ¢·wÅ¾ĉ¿ ±v¾Õ این فرد در طراحی، نصب و تنظیم دستگاه‌های مدیریت خانه‌های هوشمند (مانند لوازم‌خانگی، دستگاه‌های امنیتی، دستگاه‌های تأمین آب و برق و غیره) تخصص دارد. خانه‌های هوشمند امروزه وجود دارند. بااین‌حال این شغل احتمالاً تا ۷ تا ۱ سال آینده وارد عرصه بازار کار نخواهد شد.

۸. 5#SPECIALIST IN OLD STRUCTUR RENOVATION/REINFORCEMENT$ Ĉúĉºé ćwăĂýw· ¢ĉĀê£ÿ ć¿wÅĀý Ì Î ¸¤ù فرد شاغل در این حرفه میزان سایش و فرسودگی در ساختمان و سازه‌ها را تعیین و راه‌حل‌هایی مانند استفاده از مواد پیشرفته را برای نوسازی یا تقویت انتخاب می‌کند. این تخصص به‌ویژه در حوزه بازسازی اماکن تاریخی شهرها محبوبیت خواهد یافت.

۹. 5#ZERO ENERGY HOUSE ARCHITECT$ ćÁ¾ýv ã¾Îù ûÿºz ćwăûwú¤·wÅ ¿wÅÿ¢·wÅ ½wúÞù متخصص این شغل با طراحی ساختمان‌های پایدار یا سبز سروکار خواهد داشت که با تکیه‌بر فناوری ریزژنراتور (منابع انرژی جایگزین، تولید انرژی سه منبعی یعنی استفاده از سه منبع انرژی هم‌زمان) و بهره‌برداری از مواد و سازه‌های ذخیره‌ساز انرژی ساختمان‌هایی خودکفا ازنظر تأمین انرژی طراحی خواهد کرد.

Ĉ¤Ċþùv ½Āùv

امور امنیتی تا پیش از دهه ۱۹۹۰ بیشتر از سوی شهروندان یا دولت موردتوجه قرار می‌گرفت. اما پس‌ازاین دهه بخشی به نام خدمات خصوصی در این حوزه توسعه یافت که به‌سرعت نیز رو به رشد گذاشت. در مشاغل این حوزه بیشتر بر بخش فوق تمرکز خواهد شد و مشاغلی که به امنیت ملی، امور نظامی و مقابله با جرائم مربوط می‌شود در این بخش نیامده است.

۱. 5#BUSINESS CONTINUITY MANAGER$ ½wíÿy Æí ÷ÿvº£ ¢ĉ¾ĉºù این متخصص استمرار فرایندهای کسب‌وکار در صورت بروز هر مشکل و یا نقص دستگاه‌های فناوری اطلاعات به دلیل حملات سایبری، خطاهای نرم‌افزاری، فجایع انسانی تأثیرگذار بر اتصال اینترنت یا موارد اضطراری را تضمین می‌کند.

۲. 5#ERGONOMIC DESIGNER OF WEARABLE SECURITY DEVICES$ ĈýºĊÉĀ~ Ĉ¤Ċþùv ćwăāwò¤Å¹ ĈùĀýĀñ½v ±v¾Õ توسعه ابزار مکانیکی کوچک برای امنیت بیشتر کاربر در مواقع ضروری از وظایف این تخصص است. این شغل به تلفیقی مناسب از تعقل و تخیل نیاز دارد زیرا مباحث حفاظت شخصی را می‌توان از زوایای گوناگون موردتوجه قرار داد. برای مثال شرکت آرم‌استار نوعی

آستین محافظ را طراحی کرده است که به دوربین، دستگاه‌های هشدار و شوکر الکتریکی مجهز است. چنین ابزاری به پوشنده لباس کمک خواهد کرد تا ضمن محافظت از خود آسیب‌های مرگباری به مهاجمین نزند.

۳. 5#MITIGATING SYSTEMIC ENVIRONMENTAL DISASTERS$ ì ĊúºÆĊÅ ĈÖĊ´ù¢Æĉ¿ ćwĉĒz ½w§j È ăwí مهندسی است که با بلایای دارای تأخیر زمانی سروکار دارد. بلایایی نظیر آلودگی هوای اطراف مراکز صنعتی، ذوب تدریجی یخ‌های قطبی، دفع مواد پلاستیکی در طبیعت یا دفع ضایعات رادیواکتیو که مردم به‌تدریج از آن‌ها آگاه می‌شوند. وظیفه این مهندس طراحی و اجرای برنامه‌هایی برای کاهش اثرات منفی این‌گونه فجایع و پیشگیری از تکرار آن‌ها است. گذشته پدیده‌هایی نظیر گرم شدن زمین، تهدیدهای نوینی در حال ظهور هستند که بشر به‌تازگی نسبت به آن‌ها نگران شده است. مقابله با این فجایع به متخصصانی ماهری نیاز دارد که قادر به تصمیم‌گیری در شرایط عدم قطعیت باشند.

۴. 5#INTEGRATED INDUSTRIAL SECURITY AUDITOR$ Ă¯½w îĉ Ĉ¤Þþ Í ¢Ċþùv Ã ½¿wz متخصص در ارزیابی وضعیت امنیتی تأسیسات موجود و پایش همه انواع تهدیدها مانند تخریب مکانیکی، آتش‌سوزی، تهدیدهای زیست‌محیطی، حملات سایبری و غیره

۵. 5#PERSONAL SECURITY DESIGNER$ ć¹¾å ¢Ċþùv ±v¾Õ متخصصی که وظیفه او ارزیابی زندگی فرد از جنبه کلیه مخاطرات محتمل (از استعداد ژنتیکی برای ابتلا به بیماری‌های خاص تا احتمال قربانی نوعی جنایت شدن) و طراحی زندگی به‌گونه‌ای که از این مخاطرات اجتناب شود، است.

۶. 5#REMOTE SECURITY COORDINATOR$ ½ÿ¹ āv½ ¿v ¢Ċþùv āºþþí ðþăwúă اپراتور دستگاه‌های امنیتی رباتیک پیشرفته خودکار که مسئولیت پایش شرایط این ربات‌ها با استفاده از حسگرها و دوربین‌های نظارتی را دارند و قادرند به‌سرعت در مواقع ضروری تیمی را برای پاسخگویی سریع اعزام کنند. این شغل شکل تکامل‌یافته محافظان امنیتی است و نهایتاً به‌طور کامل با دستگاه‌های امنیتی خودکار جایگزین خواهد شد.

ć¹½ĀývĀă

هوانوردی یکی دیگر از حوزه‌های بسیار بااهمیت برای آینده جهان است که در بخش‌هایی چون دستگاه‌های هوانوردی کوچک، فرودگاه‌های منطقه‌ای و نظایر آن در حال رشد است. بشر ظهور فناوری‌های خط شکنانه فراوانی را در این حوزه انتظار دارد که اهمیت آن را در آینده بیشتر نیز خواهد کرد. فناوری‌های نوظهور با خود مشاغل و تخصص‌های نوینی را به همراه خواهند آورد:

۱. 5#**AIRCRAFT RECYCLING TECHNOLOGIST**$ wúĊ~vĀă ¢åwĉ¿wz ½ÿwþ$ متخصص در توسعه روش‌های بازیافت برای مواد اولیه، تجهیزات و اجزای چارچوب هواپیما که البته شغلی قدیمی است. اما با پیشرفت فناوری‌های ساخت هواپیماهای نوین این شغل نیز همواره رو به توسعه بوده است و در آینده نیز اهمیت بیشتری خواهد یافت.

۲. 5#**AIRSHIP DESIGNER**$ wúĊ~wÒå ±v¾Õ متخصص در طراحی انواع مدل‌های فضاپیما بر اساس کاربرد آن‌ها نظیر باربر یا مسافربر که به‌تدریج اهمیت آن به‌شدت افزایش خواهد یافت.

۳. 5#**AIRSHIP INFRASTRUCTURE DESIGNER**$ wúĊ~wÒå ¢ ·wÅ¾ĉ¿ ±v¾Õ شاغلان این حوزه در طراحی فرودگاه، آشیانه، انبارهای تعمیر و نگهداری و اجزای زیرساخت ناوبری فضاپیماها تخصص خواهند داشت. این تخصص برای حمل‌ونقل و جابجایی مسافران هوایی به‌ویژه به مناطق صعب‌العبور و دور از دسترس نیز همچنان کاربرد دارد.

۴. **DYNAMIC CONTROL SMART MANAGEMENT SYSTEM** $ wĉĀ~ ó¾¤þí ºþúÉĀă ¢ĉ¾ĉºù ø¤ÆĊÅ ±v¾Õ 5#**DESIGNER** حرفه‌ای که با طراحی نرم‌افزار برای کنترل هوایی در شهرهای پر رفت‌وآمد و پرترافیک سروکار دارد. رشد چشمگیر هوانوردهای بی‌سرنشین و عمومی همراه با افزایش بار سنگین جابجایی فضایی و حرکت به‌سوی مدیریت انعطاف‌پذیر ترافیک اهمیت این شغل را در آینده افزایش خواهد داد.

۵. Ĉ£wĈöúÝ ćwăā¹v¹ ôĈö´£ 5#**OPERATING DATA ANALYST**$ پردازش داده‌ها و آماده‌سازی دیدگاه‌های تخصصی بر اساس پایش مناطق هوایی و فضاهای اطراف از اهم وظایف این تخصص است. این شغل نیز در حال حاضر وجود دارد ما به دلیل افزایش اهمیت سفرهای هوایی و تنوع وسایل نقلیه هوایی اهمیت آن رو به افزایش است.

۶. ĈÅºþĄù ºĈöĀ£ ćwăwúĈ~vĀă ì¯Āí 5#**SMALL AIRCRAFT PRODUCTION ENGINEER**$ تخصص طراحی و مدل‌سازی هواپیماهای مقرون‌به‌صرفه با پیچیدگی‌های متنوع برای هوانوردی عمومی که نمونه‌های از آن در خاور دور وجود دارد. بر اساس پیش‌بینی‌ها تقاضا برای این شغل افزایش خواهد یافت.

۷. ±v¾Õ ÔÅvÿ ¿vÿ¾~ ûÿºz üĊÊý¾Å wz ćwă¡½wĄù üĊz ćvĂå¾³ $ **UNMANNED FLIGHT INTERFACE** **DESIGNER CROSS-PROFESSIONAL SKILLS**#5 متخصصی که واسطها و بسته‌های نرم‌افزاری موردنیاز برای کنترل هواپیماهای بدون سرنشین را طراحی می‌کند. این فرد مسئول برنامه‌ریزی و عملیاتی کردن سیستم‌های پشتیبانی، مسیریابی و ایمنی هواپیماهای بدون سرنشین است که کاربرد و اهمیت آن در صنعت هوابرد رو به افزایش خواهد بود.

¾þă ÿ ð þă¾å

فرهنگ یکی از قدیمی‌ترین فضاهای خلاقیت بشری است ولی به‌تدریج به امتیاز انحصاری دایره محدودی از متخصصان محدود شده است. با توجه به عملیات روتینی که توسط ماشین‌ها انجام می‌شود، افراد بیشتر و بیشتری درگیر فعالیت‌های خلاقانه و تولید کارهای هنری خود خواهند شد. مشاغل دارای آینده روشن در این حوزه عبارت‌اند از:

۱. xwĉ¿½v ć¾þă 5#**ART APPRAISER**$ اگرچه بحث ارزیابی آثار هنری همیشه وجود داشته است، اما به دلیل ظهور فناوری‌های نوین و افزایش پیچیدگی‌های هنری نیاز به این تخصص ضروری‌تر شده است. متخصص این شغل قادر است اشکال نوین کارهای هنری متشکل از عناصر ناهمگون را ارزیابی کرده و پیچیدگی و یا شکنندگی آن‌ها را موردتوجه قرار دهد. آثار هنری علمی، و آثار هنری و یا اجراهای خیابانی نمونه‌هایی از این پیچیدگی هستند که نیاز به ارزیابی هنری دارند.

۲. Ĉ¤Å¾~¾Å ćwă¾þă ĈÞú« 5#**COLLECTIVE ART SUPERVISOR**$ افزایش پیچیدگی و امکان به‌کارگیری عناصر گوناگون علمی و یا دیجیتالی در آثار هنری و گسترش ابعاد این آثار باعث شده است تا تیم‌های گسترده‌تری برای خلق برخی از این آثار نیاز باشد. وظیفه این شغل برپا کردن تیم‌های هنری برای انجام پروژه‌های خلاقیتی خاص است. این تیم‌ها ممکن است متشکل از هنرمندان حوزه‌های مختلف، دانشمندان، طراحان نرم‌افزار و افراد حرفه‌ای از سایر حوزه‌ها باشد.

۳. Ĉz¾ù ¢õw³ çĒ· 5#**CREATIVE STATE TRAINER**$ متخصص پرورش و ایجاد تناسب ذهنی که به هنرمندان کمک می‌کند تا وارد حالت فلو (جذب شدن کامل فرد در کاری که در حین انجامش است) و سایر حالاتی که مشخصه افزایش خلاقیت هستند، بشود. این مربی در توسعه آگاهی نیز درگیر است. زیرا یکی از مهم‌ترین چالش‌ها برای فرد هنرمند تأمل مستمر بر روی واقعیت است. افزایش گسترده تمرکز شرکت‌ها بر خلاقیت و نوآوری، افزایش زمان آزاد انسان‌ها به دلیل ظهور زندگی دیجیتالی و از سوی دیگر تنوع حوزه‌های هنری و پیچیدگی‌های مربوط به آن باعث می‌شود تا هنرمندان و خلاقان بیشتری برای آینده نیاز باشند و این افراد به مربی نیاز خواهند داشت.

۴. øöÞù Ĉ Í Ā Î · ĂÞÅĀ£ ¢ åv¾Ù Ü{Õ 5#**PERSONAL AESTHETIC DEVELOPMENT TUTOR**$ فرد شاغل در این حرفه برای کاربر مسیرهای فردی تعامل با آثار هنری را ایجاد می‌کند. او دانش بسیار خوبی در خصوص محیط فرهنگی دارد و برنامه‌های توسعه ظرافت طبع را بر اساس سلیقه‌ها، نیازها و فرصت‌های مشتری طراحی می‌کند.

۵. ºþù¾þă ĈúöÝ 5#**SCIENCE ARTIST**$ این فرد داده‌های علمی و دانش را در کارهای خلاقانه و هنری به کار می‌گیرد. هنر علمی تنها توسط افراد مورداستفاده قرار نمی‌گیرد، بلکه نهادهای آموزشی نیز از آن استفاده می‌کنند. برای مثال دانشگاه MIT مرکزی خاص خود با نام مرکز علم، هنر و فناوری دارد. این شیوه از فعالیت‌های هنری و خلاقانه رو به رشد است.

Ç ¿Ãùj

فناوری اطلاعات یکی از سریع الرشدترین بخش‌های اقتصاد است. تغییرات رخداده در این بخش فرصت‌های جدید و خارق‌العاده‌ای را به روی سایر حوزه‌ها نظیر طراحی، حمل‌ونقل، مدیریت منابع، بازاریابی و آموزش بازکرده است. از سوی دیگر پیشرفت‌های متعدد در حوزه‌های گوناگون علم و فناوری و فعالیت شرکت‌های چندملیتی در مناطق جغرافیایی مختلف نیاز به آموزش را افزایش داده است. برخی از مشاغل جدید و آینده دار در این حوزه عبارت‌اند از:

۱. Õ¾v³Ĉ vzÀ½vj ùÃ¿Ç jñwăĈ$ **DESIGER OF CONSCIOUSNESS TRAINING TOOLS**#5 طراحی و خلق برنامه‌ها و تجهیزات (برای مثال دستگاه بازخورد بیولوژیک) مورداستفاده برای آموزش چگونگی ورود به حالات پربار هوشیاری (تمرکز بالا، کسب آرامش، افزایش توانایی‌های خلاق و غیره) وظیفه اصلی این شغل است. برای نمونه می‌توان دستگاه‌هایی را نام برد که به کاربر نحوه تعمق، آرامش و یا کسب آگاهی را آموزش می‌دهد. ازجمله آموزش‌های مهمی که در آینده نقش خاصی برای ارتقای کلیه سطوح آموزشی ایفا خواهد کرد.

۲. ·Öĉy ¿ĉÆ ¢zÃ÷ $**ECOPREACHER**#5 پیشرفت‌های صنعتی، علیرغم مزایایی که دارند، و افزایش مصرف‌گرایی اغلب برای محیط‌زیست تهدید به‌حساب می‌آیند. آموزش در این زمینه همواره اهمیت داشته است و لازم است بیشتر و گسترده‌تر شود. به همین دلیل تخصصی که این نیاز آموزشی را برآورده سازد در آینده بیشتر نیاز خواهد بود. ایجاد و اجرای برنامه‌های آموزشی علمی و عملی برای کودکان و بزرگ‌سالان درباره رفتار مناسب جهت کاهش اثرات منفی بر محیط‌زیست (عدم مصرف بی‌رویه و مازاد، جداسازی زباله‌ها، سبک زندگی متناسب با محیط‌زیست و غیره) و برای شرکت‌های صنعتی درباره عملکردهای صنعتی مناسب محیط‌زیست مهم‌ترین وظایف این تخصص است.

۳. ăúwăþ ð íþþºā ~Ē£æÃ½÷ jùÃ¿ÉĈ jýĒĉü $**EDUCATIONAL ONLINE PLATFORM COORDINATOR**#5 متخصصی است که در نهادهای آموزشی و یا پروژه‌های آموزشی مستقل کار می‌کند و در زمینه‌های آموزش آنلاین، پشتیبانی توسعه دوره‌های آنلاین در موضوعات یا رشته‌های خاص و سازمان‌دهی و ترویج دوره‌های ویژه یا مسیرهای دانشگاهی استاندارد شایستگی بالایی دارد. این هماهنگ‌کننده ارتباط میان معلمان و فراگیران را طی دوره‌ها و روی پلاتفورمها اداره و نیازهای بهبود پلاتفورم را تعریف می‌کند. با توجه به اهمیت دوره‌های آموزشی آنلاین، این شغل نیز در آینده اهمیت بیشتری خواهد یافت

۴. Õ¾v± ùÆĊ¾ jùÃ¿ÉĈ $**EDUCATIONAL PATHWAY DESIGNER**#5 متخصص ساخت مسیری آموزشی برای متخصصانی که تازه وارد حوزه کاری جدیدی شده‌اند. این مسیر از مجموعه‌ای از دوره‌های آموزشی ساخته می‌شود که توسط نهادهای آموزشی، ازجمله برنامه‌های آنلاین، مربیان، شبیه‌سازها، کارورزان و غیره فراهم آمده است. این متخصص بر اساس دوره‌های فوق نوعی مسیر آموزشی را طراحی می‌کند که در آن مسیر ویژگی‌های فیزیولوژیک، توانمندی‌ها و اهداف فرد تحت آموزش موردتوجه قرارگرفته است.

۵. jùÃ¿ Ç ¹ăþºā zw¿ć $**GAME EDUCATOR**#5 بازی یکی از شیوه‌های آموزشی است که به شکل روزافزونی در آموزش‌وپرورش جهان، حتی برای بزرگ‌سالان، موردتوجه قرار خواهد گرفت. این فرد در طراحی برنامه‌های آموزشی مبتنی بر فنون بازی که فرد آموزش‌گیرنده در آن مانند یکی از شخصیت‌های بازی عمل می‌کند تخصص دارد. این متخصص به‌تدریج جایگزین معلم‌های سنتی خواهد شد.

۶. vÅ¤w¹ zw¿ć $**GAME MASTER**#5 چنین فردی متخصص طراحی و سازمان‌دهی بازی‌های آموزشی (کسب‌وکار، تاریخ، علمی تخیلی و غیره) و پشتیبان بازی با استفاده از شبیه‌سازها است. پتانسیل آموزشی بازی از سال ۲۰۰۰ به بعد در کشورهای بسیاری موردمطالعه قرارگرفته است و اخیراً بازی‌سازی (به‌کارگیری سازوکارهای بازی در فرایندهای جدی) روندی موردتوجه شده است. تمامی افراد و شرکت‌ها و سازمان‌هایی که قصد دارند با استفاده از بازی کارکنان یا فرزندان خود را آموزش دهند به چنین تخصصی نیاز خواهند داشت.

۷. MIND FITNESS COACH# متخصصی که برای تربیت مهارت‌های شناختی کارکنان (حافظه، تمرکز، تندخوانی، محاسبات ذهنی و مانند آن) با استفاده از برنامه‌ها و وسایل خاص و توجه به روان و مقاصد کاربر برنامه طراحی می‌کند. این گروه از برنامه‌ها نیز در چند سال اخیر ظهور کرده‌اند و رشد آن‌ها با توجه به نیازهای آموزشی آینده جهان حتمی است.

۸. MODERATOR# متخصصی که بحث‌های گروهی حول موضوعی خاص یا فعالیت‌های خلاقانه جمعی را برای کمک به یادگیری مطالب جدید حین فعالیت‌های عملی سازمان‌دهی می‌کند. مجموعه‌ای از مهارت‌ها در علوم اجتماعی، روانشناسی و بازاریابی وجود دارند که کسب آن‌ها پس از اتمام دوره‌های آموزشی اهمیت فراوانی پیداکرده است و متعادل‌کننده باید تعادل میان آموخته‌های دانشگاهی و نیازهای نوین را برقرار سازد.

۹. PROJECT TRAINING ORGANIZER# فردی متخصص در طراحی و سازمان‌دهی برنامه‌های تربیتی که بر آماده‌سازی و اجرای پروژه‌ها در بخش‌های واقعی اقتصاد تمرکز دارد.

۱۰. STARTUP MENTOR# واژه‌های منتور و استارت آپ جدید نیستند، اما در فضای خلاقانه و متکی بر نوآوری آینده اهمیت آن‌ها هرروز بیشتر می‌شود. این متخصص در راه‌اندازی پروژه‌های استارت آپ، سرپرستی تیم‌های استارت آپ جدید و آموزش مهارت‌های کسب‌وکار به افرادی که می‌خواهند استارت آپ راه بیندازند تبحر دارد. در کشورهای پیشرفته منتورینگ به شکل تخصص توسعه‌یافته است، اما در بسیاری از کشورهای جهان این واژه و این مهارت هنوز ناشناخته است.

ć¿vÃý ûwúąù ÿ ØÆĉ½Ã£

توریسم پدیده‌ای کهن است که به‌مرور با تسهیل امکان سفر گسترش و محبوبیت عمومی یافته است. مهمان‌نوازی بخش مهمی از جلب توریست و توسعه توریسم است. صنعت مهمان‌نوازی (هتلداری، رستوران‌داری، هدایت تورها و غیره) پتانسیل رشد فراوانی در بسیاری از کشورهای جهان که مکان‌های جذاب و دیدنی دارند و هنوز نتوانسته‌اند آن را به‌خوبی به جهان معرفی کنند، دارد. فرصت‌های رشد به‌ویژه در خارج از کلان‌شهرها، مراکز صنعتی بزرگ، شهرهای کوچک با پیشینه تاریخی و طبیعت هنوز وجود دارد. انتظار می‌رود در این حوزه مشاغل زیر رشد و توسعه پیدا کنند:

۱. Augmented reality area designer# طراحی لایه‌های گوناگون واقعیت‌افزوده در یک منطقه، با در نظر گرفتن دورنما و همچنین بافت تاریخی و فرهنگی آن منطقه از وظایف اصلی این شغل است. برای مثال این متخصص می‌تواند در فیلم معروف استیلاچی گزینه‌های متعددی را برای میدان سرخ مسکو در عصر ایوان مخوف سال ۱۹۱۷ طراحی کند. این طراح باید در مهارت‌های طراحی را با مهارت‌های برنامه‌ریزی ترکیب کند و هم‌زمان دانش تاریخی خوبی داشته باشد. این تخصص نه‌تنها در حوزه فیلم‌سازی بلکه در بسیاری از حوزه‌های دیگری که از فیلم برای تبلیغ یا آموزش استفاده می‌کنند کاربرد خواهد داشت و اهمیت آن در آینده دوچندان می‌شود.

۲. Individual tour director# فردی حرفه‌ای که قادر به توسعه تورهایی خاص بر مبنای نیازهای مشتریان منفرد و هدایت شخصی این تورها است. این شغل به‌نوعی درگذشته وجود داشته است، اما با حذف اپراتورهای سنتی سفر به یکی از جریان‌های اصلی توریسم مبدل خواهد شد.

۳. Robot attendant# متخصص در مدیریت روبات‌های هتل که از هم‌اکنون نمونه‌هایی از آن‌ها در هتل‌های آمریکا، چین، ژاپن و سایر کشورها وجود دارد. اگرچه ربات‌های بازکننده درها، خانه نگهدار و پیک‌ها کار خود را به‌خوبی انجام می‌دهند، اما هنوز لازم است فردی برای کنترل امور به همراه آن‌ها باشد. چنین همراهی باید متخصصی سازمان‌یافته با مهارت‌های چندوظیفه‌ای باشد که با علوم مکانیک آشنا بوده و در زمینه هوش مصنوعی تجربه داشته باشد.

۴. Smart travel system designer# متخصص در طراحی سیستم‌های خرید بلیط خودکار، رزرو هتل و مسیریابی که اکنون نیز توسط برخی تورهای معروف مورداستفاده قرار می‌گیرند. سرمایه‌گذاری روی الگوریتم‌های

جستجوی منحصربه‌فرد نیز آغازشده است. تقاضا برای یافتن راه‌حل‌های ساده، راحت و ارزان رو به افزایش است و میزان سفرها نیز بیشتر و متنوع‌تر می‌شود و بنابراین چنین نرم‌افزارهایی و بالطبع آن افرادی که این نرم‌افزارها را طراحی و مدیریت می‌کنند مورد تقاضای روزافزون جامعه جهانی خواهند بود. بعلاوه توجه بیشتری به‌سوی شخصی‌سازی تورها و برنامه‌های سفر فردی معطوف شده است، چراکه بسیاری از توریست‌ها مایل‌اند ذائقه‌های متنوع خود را در سفر دنبال کنند و صرفاً پیرو گروهی با برنامه‌ای از پیش تعیین‌شده نباشند.

۵. **Space brand manager** فرد شاغل در این حرفه مشاور و مسئول پر کردن جهان مجازی با محتوای فرهنگی مرتبط با محیطی خاص است. او تصاویر و افسانه‌های مربوط به یک مکان را خلق می‌کند و به فضای حاکم در آن منطقه در دنیای مجازی طراحی‌های زیبا، هویت، اخبار، خدمات توریستی و رویدادهای گوناگون را می‌افزاید. تمامی این موارد باعث می‌شود تا محل موردنظر به محیطی بی‌همتا تبدیل شود. بازدیدکنندگان جذب‌شده و محل به مقصدی رقابتی برای توریست‌ها تبدیل می‌شود. این شغل نیز هم‌اکنون وجود دارد و باگذشت زمان رشد خواهد کرد. افزایش رقابت برای جلب توریست ارزش این تخصص را بیشتر نیز خواهد کرد.

۶. **Territory architect** خلق دورنمای اطلاعاتی برای توریست‌ها با در نظر گرفتن واقعیت‌های منطقه، نوع کاربران و روندهای محبوب کنونی در صنعت توریست از وظایف این تخصص است. هنگامی‌که مدیر برند نقش راهبری خلاق را ایفا می‌کند، معمار قلمرو طراحی است که به دنبال راه‌حل‌های جزئی و اختصاصی برای وظایف خاص است.

۷. **Tour navigator designer** فردی متخصص فناوری اطلاعات که با طراحی نرم‌افزار و کاربردهای آن‌ها برای کمک به کاربر جهت یافتن مسیرشان در برنامه‌های سفری خاص و بر اساس سلایق و برنامه‌های خودشان و برنامه‌های رویدادهای فرهنگی منطقه سروکار دارد.

Ĉù¾ñ¾Å ÿ ĂýwÅ½

رسانه‌های جمعی در قرن بیستم به ابزاری اساسی برای برقراری ارتباط تبدیل شده‌اند و تأمین بیشترین اطلاعات ممکن برای مردم درباره آنچه در جهان رخ می‌دهد، هدف اصلی آن‌ها بود. این نقش در قرن بیست و یکم در حال تغییر است و محدود کردن جریان اطلاعات را ممکن می‌سازد. منابع رسانه‌ای در پاسخ به این تغییر به‌تدریج از منبع خبری صرف بودن فاصله می‌گیرند و با اعمال فیلترهای قدرتمند، شفاف‌سازی پیام‌های مهم و کمک به فرد جهت آشنایی با دستور کارها مسیر جدیدی را برای انتقال اطلاعات در پیش می‌گیرند. حتی امروزه کاربر می‌تواند خوراک ورودی خود را به‌گونه‌ای تنظیم کند که صفحه مشخصی را مطالعه کند یا با استفاده از نرم‌افزارهای خاص اطلاعات موجود در شبکه‌های اجتماعی را فیلتر کند. البته ساده‌سازی این تنظیمات به‌گونه‌ای که کاربر به‌راحتی بتواند آن‌ها را انجام دهد جزو مطلوب‌های دنیای دیجیتالی است. کاربران در آینده قادر خواهند بود تا جریان اطلاعاتی خاص خود را تنظیم و اصول ویرایشی خاص خود را بر آن اعمال کنند. این دنیای نوین رسانه که علاوه بر خبررسانی در حوزه سرگرمی نیز فعال است مشاغل نوینی را می‌طلبد.

۱. **Content aggregator editor** مدیریت مجاری اطلاعاتی و گزینش محتوای سازگار با انتظارات کاربر از وظایف این فرد است که از طریق تنظیم موتورهای جستجو و نرم‌افزارهای گردآوری و پردازش اطلاعات محقق می‌شود. این شغل نیز هم‌اکنون وجود دارد، اما با گسترش رسانه‌های گروهی شخصی نیاز به آن در آینده رشد خواهد کرد.

۲. **Emotion designer** این فرد با استفاده از مجاری اطلاعاتی جدید، شامل مسیرهای که مغز کاربر را هدف قرار می‌دهند، برای محتوا پس‌زمینه عاطفی ایجاد می‌کند. به عبارت دیگر، این طراح محرک‌های اندام حسی را کنترل می‌کند تا احساسات و عواطف ضروری برای کاربر در زمان استفاده از محتوا را ایجاد کند.

۳. **Game practitioner** این متخصص سازمان دهنده، خالق و راهنمای دنیای بازی در فضاهای واقعی و مجازی است. امروزه مسابقات شهری، از رانینگ سیتی تا کلاستروفوبیا که برای مکان‌های محدود طراحی‌شده است محبوبیت دارند.

همچنین بازی‌های واقعیت جایگزین نیز پدید آمده‌اند که در آن‌ها مرز میان بازی و زندگی واقعی بسیار مبهم است. این نوع از بازی‌ها در آینده گسترش خواهند یافت و طراحان فضاهای موردنیاز این بازی‌ها نیز سرشان شلوغ خواهد شد.

۴. **Info stylist** آرایشگری در دنیای واقعی محبوبیت زیادی دارد، اما این تخصص به گزینش اطلاعات و نحوه ارائه آن به‌گونه‌ای که با نیازهای کاربر خاص تطابق داشته باشد مربوط می‌شود. در آرایشگری اطلاعات جریان محتوا به‌صورت گزینشی از اطلاعات توصیه‌شده، بر اساس نواحی جغرافیای خرید، به کاربر عرضه می‌شود. نواحی جغرافیایی خرید با استفاده از درخواست‌های جستجو یا علایقی که در پروفایل شبکه اجتماعی کاربر مشخص‌شده است، تعیین می‌شود. این کار عموماً با استفاده از الگوریتمی که شخص برای مقاصد خودش ایجاد کرده است، از بیرون انجام می‌شود. در آینده تمنای مردم برای ایجاد چنین جریانی برای خودشان و توسط خودشان افزایش خواهد یافت و تقاضا برای الگوریتم‌های مشابه را بیشتر خواهد کرد و درنتیجه یا باید خود آرایشگر اطلاعاتی خود باشند یا از متخصصی در این زمینه کمک بگیرند.

۵. **Media policeman** پلیس رسانه نوعی مجری قانون در فضای رسانه است. او از طریق پایش منابع رسانه به‌صورت شخصی و یا با استفاده از نرم‌افزارهای خاص تخلف‌ها را شناسایی خواهد کرد. این وظیفه هم‌اکنون نیز توسط نهادهایی در کشورهای مختلف انجام می‌شود. بااین‌وجود، در آینده به دلیل افزایش استفاده نادرست از اطلاعات و جنایات سایبری به شغلی مجزا تبدیل خواهد شد.

۶. **Media software designer** این متخصص با همکاری روانشناسان، زبان شناسان و مهندسان به خلق ابزار نرم‌افزاری برای یافتن، پردازش و توزیع اطلاعات بر روی اینترنت می‌پردازد

۷. **SEMANTIC FIELD PRODUCER** مسئول شکل‌دهی نوعی جهان‌بینی عمومی که بر اساس آن جریان‌های رسانه‌ای که او کنترل می‌کند خلق خواهند شد. این متخصص گزینشگرهای محتوایی آر کنترل می‌کند که در چهارچوب نوعی جهان‌بینی فرضی جریان‌های اطلاعات را برای کاربران ایجاد می‌کنند و تنظیمات ربات‌های رسانه‌ای را در سطح بالا انجام می‌دهد.

۸. **VIRTUAL REALITY ARCHITECT** متخصص طراحی راه‌حل برای کار، مطالعه و اوقات فراغت در واقعیت مجازی. او بر اساس پارامترهای بیولوژیک و فیزیولوژیک کاربر نرم‌افزار و سخت‌افزار طراحی می‌کند.

۹. **VIRTUAL WORLD DESIGNER** این فرد خالق مفاهیمی نظیر، فلسفه، قوانین طبیعی و اجتماعی، تعاملات اجتماعی و استانداردهای اقتصادی، چشم‌انداز، معماری، حواس، حیوانات و دنیای اجتماعی برای جهان‌های مجازی است.

شغل‌های آینده

صنعت زیست‌فناوری رشد گسترده‌ای را در جهان صنعتی داشته و در جهان نیمه‌صنعتی و در حال توسعه نیز به شدت در حال رشد است. این صنعت هنوز هم یکی از نویدبخش‌ترین صنایع جهان در دهه آینده است که خود توسعه خواهد یافت و بر شاخه‌های دیگر صنعت نظیر بهداشت، مهندسی برق و قدرت، مواد پایه و اقتصاد روستایی و شهری نیز تأثیر چشمگیری خواهد گذاشت. در این صنعت نیز مشاغل تخصصی جدیدی در حال ظهور و یا رشد هستند که مهم‌ترین آن‌ها عبارت‌اند از:

۱. **LIVING SYSTEMS DESIGNER** متخصص در برنامه‌ریزی، طراحی و ایجاد فناوری‌های با چرخه بسته که با سلول‌ها و میکروارگانیسم‌های اصلاح ژنتیکی شده سروکار دارند. چنین شغلی در شهرهای پایدار جایگزین نخواهد داشت زیرا شاغلین این حرفه قادر خواهند بود تا ظرفیت موردنیاز بیوراکتورها را محاسبه کنند، در طراحی مزارع شهری مشارکت داشته باشند و سیستم‌های بازیافت ضایعات را توسعه دهند.

۲. **PARK ECOLOGIST** متخصصی است که مسئولیت پایش و تحلیل شرایط زیست‌محیطی فضاهای عمومی (پارک‌ها، بلوارها، میدان‌ها، کوچه‌ها و غیره)، توسعه و اجرای راه‌حل‌های محوطه‌سازی، ایجاد

فضاهایی برای اسکان و افزایش جمعیت حیوانات و حشرات و سایر اقدامات لازم برای حفظ تعادل زیست‌محیطی در فضاهای سبز شهری را بر عهده دارد. این شغل در حال حاضر توسط برخی مؤسسات مسئول نگهداری از پارک‌های بزرگ ایجادشده است و به دلیل رشد جمعیت و لزوم توجه به فضاهای سبز برای بهبود محیط‌زیست مردم به‌ویژه در شهرها در آینده نیز تقاضای آن به‌شدت افزایش خواهد یافت.

۳. ¿ĉÆ¢ åþ¤ÿ½ ÅĊÆ¤ø (**SYSTEM BIOTECHNOLOGIST**) متخصص جایگزین کردن راه‌حل‌های منسوخ شاخه‌های مختلف علمی با محصولات زیست‌فناوری که برای مثال به شرکت‌های حمل‌ونقل کمک خواهند کرد تا سوخت دیزل را با سوخت زیستی جایگزین کنند و یا به صنعت ساخت‌وساز کمک خواهند کرد تا مواد اولیه خود را از سیمان و بتون به زیست مواد تغییر دهند.

۴. ¿ĉÆ¢ ÷Āz ÉþwÃ ÉĄÀ¾Ć (**URBAN ECOLOGIST**) این فرد متخصص در طراحی شهرهای جدید با استفاده از زیست‌فناوری‌های مناسب محیط‌زیست است که در حوزه‌های ساخت‌وساز، مهندسی قدرت و کنترل آلودگی محیط‌زیست تخصص دارد. این شغل در حال حاضر در کشورهایی مانند مالزی، چین، امارات متحده عربی، هند، کره جنوبی و بسیاری از کشورهای اروپا در حال شکل‌گیری است و علت آن تمرکز کشورهای فوق بر ساخت شهرهای سبز است. تفکر ساخت شهرهای جدیدی که با محیط‌زیست دوست باشند در حال گسترش است و به همین دلیل این شغل نیز در آینده رشد بیشتری خواهد کرد.

Ć¿½ÿ¤Êí

افزایش جمعیت جهان که پیش‌بینی می‌شود تا سال ۲۰۵۰ حدود ۲ میلیارد نفر دیگر به آن اضافه شود، نیاز به تأمین غذای بیشتر را افزایش خواهد داد. بشر برای اجتناب از قحطی جهانی باید به بخش کشاورزی توجه بیشتری را معطوف کند و در این راه چالش‌هایی جدی نظیر تغییرات آب‌وهوایی، خستگی و فرسودگی خاک، کاهش تنوع زراعی و انقراض برخی از گونه‌های گیاهی بر سر راه این بخش وجود دارد. مقابله با این چالش‌ها فناوری‌های نوین و درنتیجه تخصص‌های جدیدی را نیاز خواهد داشت. برخی از مشاغل نوظهور و یا رو به رشد در این حوزه به شرح زیر هستند:

۱. ¿ĉÆ¢ ÷Āz ÉþwÃ íÊ¤ÿ½¿Ć (**AGRICULTURAL ECOLOGIST**) این شخص علاوه بر آشنایی با مباحث زیست‌بومی کشاورزی باید در بحث دفع ضایعات تخصص داشته باشد و با توسعه اصول دفع ضایعات کشاورزی و بازیابی خاک آشنایی کامل داشته باشد.

۲. ¤éÎ w¹¹¤Û íÊ¤ÿ½¿Ć (**AGRICULTURAL ECONOMIST**) متخصصی سطح بالا است که عملکرد رقابتی محصولات و هزینه اندوز بودن عملیات شرکت‌های کشاورزی را تضمین می‌کند. او عملیات شرکت‌های کشاورزی را به‌گونه‌ای تنظیم می‌کند که با نیازها و الزام‌های بازار متناسب باشد. مسئولیت مدیریت مخاطرات اقتصادی شرکت‌ها نیز با این متخصص است. افزایش حجم تولیدات کشاورزی در آینده و ضرورت تولید اقتصادی در این بخش اهمیت و تقاضا برای این شغل را افزایش خواهد داد.

۳. ùª¸Î Ì ¤ÕĒÝw¡ ÿ ùĄþºÅĈ íÊ¤ÿ½¿Ć (**AGRICULTURAL INFORMATICS AND ENGINEERNG EXPERT**) این فرد نیز باید از تخصصی سطح بالا درزمینهٔ پیاده ساختن فناوری‌های نوین برخوردار باشد و با کامپیوتری کردن و خودکارسازی تأسیسات کشاورزی سروکار دارد. این تخصص نیز به دلیل ضرورت افزایش تولید محصولات کشاورزی در سال‌های آتی و لزوم استفاده از فناوری‌های نوین در این بخش آینده روشنی خواهد داشت.

۴. ¤~¾¤€Ã½ £¬ĄĊÀ¤ ¡ íÊ¤ÿ½¿Ć ·Ā¹íw½ (**AUTOMATED FARMING EQUIPMENT OPERATOR**) پیشرفت فناوری در بخش کشاورزی و خودکار شدن فرایندهای تولید نیاز به اپراتورهای هوشمند و کارآمد در این زمینه‌ها را افزایش خواهد داد. فرد متخصص در این شغل وظیفه مدیریت ماشین‌آلات خودکار مانند دستگاه‌های حسگر، پهپادها و ربات‌های کشاورزی را در مزرعه بر عهده خواهد داشت.

۵. 5#CITY FARMER$ ć¾ĄÉ ¿½ÿwÊí متخصص در نصب و نگهداری امکانات کشاورزی صنعتی در آسمان‌خراش‌ها و پشت‌بام‌های آن‌ها در شهرهای بزرگ است. مزارع عمودی سازه‌های پایدار و سازگار با محیط‌زیست هستند که می‌توانند در زمینه‌های کشاورزی و دامداری در محدوده شهر مورداستفاده قرار گیرند. این سازه‌ها در آینده نزدیک بیشتر در دستور کار قرار خواهند گرفت. اولین مزرعه عمودی تجاری در سال ۲۰۱۲ در سنگاپور ساخته شد و در حال حاضر برای تولید مزارع آسمان‌خراش در کره جنوبی، چین، امارات متحده عربی، ایالات‌متحده آمریکا، فرانسه و سایر کشورها برنامه‌ریزی‌شده است. افزایش جمعیت و تراکم جمعیت شهری، لزوم توجه به مسائل زیست‌محیطی در شهرها و نیاز به بالا بردن راندمان تولید در واحد سطح نیز تقاضا برای کشاورزی عمودی را بیشتر خواهد کرد که به معنی رشد این شغل در آینده خواهد بود.

۶. 5#GMO FARMER$ āºÉ ÊîĊ¤ýÁ ±Ē Ív ¡ đĀÎ´ù ¿½ÿwÊí متخصص در به‌کارگیری محصولات اصلاح ژنتیکی شده در کشاورزی که با پیاده‌سازی یافته‌های زیست‌فناوری و خلق محصولاتی با مشخصات از پیش تعیین‌شده سروکار دارد. در حال حاضر حدود ۱۱ درصد مزارع جهان زیر کشت محصولات اصلاح ژنتیکی شده قرار دارند و به‌مرور با ایمن شدن این فناوری و ایجاد اطمینان عمومی نسبت به‌سلامت محصولات کشاورزی فوق میزان کشت افزایش خواهد یافت که به معنی نیاز بیشتر به متخصصان این خوزه است.

ćÁ¾ýv ā¾Ċ·» ÿ ºĊõĀ£

بحران انرژی از یک‌سو و نیاز روزافزون جهان به تأمین انرژی برای اهداف گوناگون باعث شده است تا حوزه تولید و ذخیره انرژی یکی از مهم‌ترین حوزه‌های موردتوجه بشر در آینده باشد. انرژی‌های جایگزین نیز از مباحث مرتبطی هستند که در آینده بیش‌ازپیش موردتوجه قرار خواهند گرفت و هر دو این حوزه‌ها به پیشرفت هر چه بیشتر فناوری نیاز خواهند داشت. پیشرفت فناوری به معنای ایجاد تخصص‌های جدید برای راهبری آن است و این خود یعنی مشاغل نوین. برخی از مشاغل مهم در این حوزه عبارت‌اند از:

۱. 5#ENERGY STORAGE DEVICE DESIGNER$ ćÁ¾ýv ā¾Ċ·» ćwăāwò¤Å¹ ±v¾Õ این متخصص درگیر طراحی انواع سیستم‌های ذخیره انرژی نظیر باطری‌های با ظرفیت بالا، جمع‌آوری‌کننده گرما، چرخ طیار و غیره خواهد بود تا امکان ذخیره انرژی برای باز توزیع آن در شبکه‌های هوشمند بین نقاط پیک و حداقل مصرف پدید آید. تولید موفق انرژی نیمی از راه است و توسعه راه‌حل‌هایی برای مصرف و ذخیره اثربخش آن نیز نیمه دوم راه خواهد بود. فعالیت‌های متعددی در این زمینه در جریان است و متخصص این حوزه در آینده مشغله بسیار بیشتری خواهد داشت.

۲. 5#LOCAL POWER SUPPLY SYSTEM SPECIALIST$ Ĉõ´ù ç¾z üĊùm£ ćwăø¤ÆĊÅ Ì Î¸¤ù طراحی، پیاده‌سازی و نگهداری از سیستم‌های تولید برق کوچک (ژنراتورهای بادی، خورشیدی، زیستی، هسته‌ای در اندازه میکرو) از وظایف این فرد است. هوشیاری زیست‌محیطی و کاهش هزینه‌های مصرف‌کننده ازجمله دلایل اصلی توسعه میکروژنراتورها هستند. این شغل در برخی از کشورهای پیشرفته ایجادشده است و به دلیل اهمیت مباحث بالا همچنان در آینده رو به رشد خواهد بود. صاحبان خانه‌های روستایی و طراحان مزارع عمودی از مشتریان اصلی این شغل خواهند بود.

۳. 5#MICRO GENERATION SYSTEM DESIGNER$ ½Ā£v¾ýÁÿ¾îĊù ćwăø¤ÆĊÅ ±v¾Õ متخصص در توسعه و طراحی راه‌حل‌های فناورانه پیشرفته برای میکروژنراتورها مطابق با نیازهای کاربر است. میکروژنراتورها در اکناف جهان توسعه می‌یابند اما در برخی موارد به دلایل خاصی نظیر شرایط آب‌وهوایی، راه‌حل‌های استاندارد پاسخگوی نیاز کاربران نیست و سیستم‌های اختصاصی برای هرکدام از این نوع الزام‌ها موردنیاز است. با توجه به تنوع شرایط در گوشه و کنار جهان نیاز به این تخصص افزایش خواهد یافت.

۴. 5#POWER GENERATION SYSTEM UPGRPADE MANAGER$ ç¾z ºĊõĀ£ ćwăø¤ÆĊÅ ćwê£½v ¾ĉºù مدیریت ارتقای تأسیسات تولید برق گازی، آبی و هسته‌ای و پیاده‌سازی روش‌های اثربخش، ایمن و پایدار برای این تأسیسات از وظایف

این تخصص هستند. علی‌رغم روند عمومی به‌سوی تنوع در منابع انرژی الکتریکی، هنوز سهم بسیار بالایی از الکتریسیته موردنیاز صنایع جهان به‌صورت متمرکز تولید خواهد شد. کهنگی و فرسودگی تجهیزات در این صنعت نیاز به ارتقا را افزایش خواهد داد و این امر به متخصصانی نیاز دارد که قادر به انتقال و به‌کارگیری بهترین تجربیات در نیروگاه‌های گوناگون باشند. بازیگران مهم این صنعت نظیر زیمنس برنامه‌هایی برای ارتقای این سیستم‌ها ایجاد کرده‌اند که بنابراین به متخصصان مرتبط نیاز خواهند داشت.

۵. ±v¾Õ ćẅăø¤ÆĊÅ ẅĊ³v ÿ ¹Ā{Āz 5#RECUPERATION SYSTEM DESIGNER$ این فرد در ارائه راه‌حل‌های فناورانه برای تسخیر انرژی مازاد وسایل نقلیه در حال حرکت، به‌ویژه هنگام ترمز کردن وسایل نقلیه‌ای مانند اتومبیل، مترو یا وسایل نقلیه عمومی الکتریکی تخصص دارد. اگرچه احیا انرژی کاری انقلابی نیست و در وسایلی مانند قطار، تراموا و تریلرها از این فناوری استفاده می‌شود، اما این فناوری تا مدت‌ها هنوز محبوبیت خواهد داشت و نیاز به متخصصانی که بتوانند چنین سیستم‌هایی را بسازند رشد خواهد کرد.

۶. ±v¾Õ ćẅăāẅò¤Å¹ Ĉýº ĊÉĀ~ āºþþíºĊōĀ£ ćÁ¾ýv 5#WEARABLE POWER DEVICE DESIGNER$ این فرد طراح سیستم‌های تولیدکننده انرژی متحرک و قابل پوشیدن است. خلق اقلام شخصی مانند لباس و کفش با قابلیت میکروژنراتوری از دیگر تخصص‌های این فرد است. نمونه‌هایی از این دستگاه‌ها هم‌اکنون نیز وجود دارند که به‌عنوان‌مثال می‌توان از لباس خیابانی مجهز به باتری‌های خورشیدی تولیدشده در ایتالیا یادکرد. اهمیت تولید انرژی و پیشرفت در حوزه میکروژنراتورها این شغل را در آینده محبوب‌تر خواهد کرد.

۷. ¤ù ¸ Î Ì xj ÿ vĀă ½¹ Í þþ ¢ ç¾z 5#WEATHER EXPERT IN POWER INDUSTRY$ این فرد در مدیریت عملیات تأسیسات تولیدکننده انرژی بر اساس شرایط آب‌وهوایی تخصص دارد. پیش‌بینی سطوح تولید انرژی با استفاده از فنون پیش‌بینی آب‌وهوا در بلندمدت از تخصص‌های این فرد است. گام‌هایی برای آماده کردن زمینه این شغل جدید برداشته‌شده است. برای مثال شورای اعتماد الکترونیکی تگزاس موسوم به ارکات پیش‌بینی بار تأسیسات تولید انرژی خود را بر پایه پیش‌بینی‌های بلندمدت آب‌وهوا بنانهاده است.

ÿ¾Ċý ¢ ĉ¾ĉºù ÿ ç¾z Üĉ¿Ā£ ćẅăĂî{É

اگر الکتریسیته خون اقتصاد است شبکه‌های توزیع نیرو سیستم گردش خون آن هستند. پیچیدگی جهان رو به رشد است و درنتیجه نیاز به شبکه‌های تأمین نیرو مشاغل مرتبط با آن نیز رو به افزایش هستند. تغییرات کلیدی شبکه‌های توزیع و مصرف نیرو به فناوری‌های شبکه هوشمند وابسته شده است. این شبکه‌ها دارای سیستم‌های کنترل هوشمندی هستند که بر اساس میزان مصرف بار در یک ساختمان مسکونی یا اداری امکان تنظیم بهینه شیوه‌های عملیاتی را به وجود می‌آورند (برای مثال، ماشین لباسشویی فقط در شب و زمان مصرف کم‌بار). مشاغل آینده مرتبط با این حوزه عبارت‌اند از:

۱. ¾~v¾Ā£½ vĉÆ¤òẅā Éẅ½Á · Ā¹½ÿăẅć ōvî¤¾ĉî Ĉ 5#ELECTRIC VEHICLE CHARGING STATION OPERATOR$ متخصص ارائه خدمات زیرساختی برای شارژ الکتریکی خودروهای برقی و سایر وسایل نقلیه (برای مثال هواپیمای باربری بدون سرنشین). آمریکا با حدود ۷۰۰۰ ایستگاه در این زمینه پیشتاز است، اما حرکت به‌سوی خودروهای برقی در سایر نقاط جهان نیز ادامه دارد و این شغل در بسیاری از کشورهای در آینده یک ضرورت خواهد بود

۲. ¤ù ¸ Î Ì ³êĀç ùÎ ¾ã íþþºā vōî¤¾ĉÆĊ¤Ă 5#ELECTRICITY CONSUMER RIGHTS EXPERT$ این فرد شبکه‌های توزیع نیرو را ازنظر ایمنی، کارایی و مطابقت با سایر نیازهای کاربر بررسی می‌کند و توصیه‌های حرفه‌ای در مورد قوانین صرفه‌جویی در انرژی ارائه می‌دهد. آمریکا و اروپا این شغل را ایجاد و سیستم‌های قدرتمندی را برای حفاظت از حقوق مصرف‌کننده ابداع کرده‌اند. چنین سیستمی برای کلیه کشورها ضروری است و در آینده شاهد رشد این شغل خواهیم بود.

۳. 5#**ENERGY AUDITOR**$ ćÁ¾ýv ÀĊúù فردی درگیر در ممیزی و ارائه مشاوره در خصوص مصرف انرژی الکتریکی است که منازل و اماکن خصوصی، مجتمع‌های مسکونی و کارخانه‌ها را ازنظر خسران انرژی بررسی می‌کند و توصیه‌هایی را برای بهینه‌سازی مصرف انرژی ارائه می‌دهد. این شغل نیز اکنون وجود دارد و به دلیل اهمیت مصرف انرژی در آینده رشد فوق‌العاده‌ای خواهد داشت.

۴. 5#**POWER CONSUPMTION SYSTEM DESIGNER**$ ç¾z ã¾Î ù øºÆĊÅ±v¾Õ این فرد در بیشینه ساختن راندمان مصرف برق در محیط کاربر و راحتی استفاده از آن تخصص دارد. او در جهت طراحی سیستم‌های مناسب، درباره بهترین ابزار برای شرایط خاص و چگونگی کار با پرمصرف‌ترین وسایل منزل، نظیر دستگاه‌های تهویه مطبوع، مشاوره می‌دهد.

۵. **POWER GRID ADJUSTER/CONTROLLER IN DISTRIBUTED** $ ÿ¾Ċý Üĉ¿Ã£ Ăî{É āºþþíó¾ºþí 5#**GENERATION** فردی متخصص در تحلیل نقصان‌های بالقوه سیستم توزیع برق، طراحی کارآمدترین شیوه‌های عملیاتی و تضمین ایمنی طرح شبکه‌های توزیع و دفع ضایعات است. او با روش‌های غیر مخرب کنترل و نحوه هدایت شبکه‌های هوشمند آشنایی دارد.

۶. 5#**POWER MARKETING EXPERT**$ ÿ¾Ċý Ĉzwĉ½v¿wz Ì Î ¸ºù تخصص این فرد در شناخت خوب بازارهای محلی و بین‌المللی تولید، توزیع و مصرف برق و برخورد مناسب با بحث فروش است. افزایش اهمیت انرژی الکتریکی و رقابت تولیدکنندگان برای فروش تقاضا برای چنین تخصصی را افزایش خواهد داد. در کشورهایی که به شکل متمرکز توزیع برق را مدیریت می‌کنند شاید این شغل جندان ضروری به نظر نرسد، اما با ظهور میکروژنراتورها و شبکه‌های توزیع کوچک و بزرگ آینده این شغل حتی در چنین کشورهایی می‌تواند درخشان باشد.

۷. 5#**SYSTEM ENGINEER FOR SMART POWER GRIDS**$ ÿ¾Ċý Üĉ¿Ã£ ºþúÉÃă ćwăÄî{É ćv¾z øºÆĊÅ Ã ºþĄù متخصصی که طراحی و مدل‌سازی شبکه‌های هوشمند، سیستم‌های میکروژنراتور و محیط‌های هوشمند برق برای مقاصد مختلف وظیفه او است. این فرد الزام‌های زیرساختی و فناورانه را برای سیستم‌ها در کل چرخه عمرشان نیز فراهم می‌آورد. برخی شرکت‌ها مانند زیمنس چنین شغلی را پیشنهاد داده‌اند و در آینده نیز این شغل به‌منظور محقق ساختن امکان کنترل به هنگام مصرف برق گسترش خواهد یافت.

ćvā¹w« ôêýÿôú³

سفرهای مردم هرروز بیشتر و بیشتر می‌شود که این امر نقش صنعت حمل‌ونقل را پررنگ‌تر می‌کند. ما فواصل دور و نزدیک را به‌صورت متناوب جابجا می‌شویم و با افزایش این جابجایی‌ها در آینده الزام‌های سخت‌تری درزمینهٔ سرعت، آسایش و هزینه سفرها پدید خواهد آمد. ظهور سیستم‌های هوشمند به‌عنوان بخشی اساسی برای زیرساخت‌های مدیریت ترافیک و کنترل وسایل نقلیه (برای مثال خودروهای بدون سرنشین) در آینده نزدیک بر این صنعت تأثیر شگرفی خواهد گذاشت. مواد و حتی جاده‌ها نیز هوشمند خواهند شد و همه این پیشرفت‌ها ظهور مشاغل نوینی را وعده می‌دهند.

۱. 5#**AUTOMATED TRANSPORTATION SYSTEM OPERATOR**$ ½wí¹Ã· ôêýÿôú³ øºÆĊÅ½Ã£v¾~v این اپراتور وظیفه مدیریت خدمات ارائه‌شده از سوی شبکه‌های حمل‌ونقل رباتیک و پیکره‌بندی نرم‌افزار کامپیوتری برای سازوکارها و دستگاه‌های رباتیک, عمدتاً بدون سرنشین، را بر عهده خواهد داشت. شغلی پراهمیت که جهان رباتیک آینده به‌شدت به آن نیاز خواهد داشت.

۲. 5#**CROSS-LOGISTICS OPERATOR**$ ÜÕwê¤ù ¡ wí½vº£ ½Ã£v¾~v فردی حرفه‌ای است که در انتخاب بهترین روش‌های جابجایی و انتقال کالا و مسافر با استفاده از شیوه‌های گوناگون حمل‌ونقل تبحر دارد. کنترل و تنظیم ترافیک در همه بخش‌های

شبکه‌های چند ماژوله، پایش احتمال ایجاد هابهای حمل‌ونقل و توزیع مجدد جریان‌های ترافیکی در شبکه‌های حمل‌ونقل از دیگر وظایف این شغل است.

۳. **DESIGNER OF COMPOSITE STRUCTURES FOR** $ ĂĊöêý ôĉwÅÿ ćv¾z ¢ĉ¿Ā ùwí ćwăā¿wÅ ±v¾Õ **VEHICLES**#5 متخصصی است که سازه‌های کامپوزیتی را بر اساس مقادیر از پیش تعیین‌شده وزن، دوام، مقاومت به سایش و غیره طراحی می‌کند. مواد کامپوزیت هم‌اکنون نیز در انواع گوناگون حمل‌ونقل مورداستفاده قرا می‌گیرند، اما متخصصان به دنبال کاربردهای جدیدی برای این مواد هستند. ازآنجاکه سازه‌ها و به‌ویژه سازه‌های عمودی در صنعت حمل‌ونقل و انبارداری کاربرد فراوان دارند و مواد کامپوزیت در این حوزه مزایای زیادی ایجاد می‌کنند، این شغل در آینده رشد بیشتری خواهد داشت.

۴. **HIGH-SPEED RAILWAY DESIGNER**$ ¾ĊÆövÜĉ¾Å üăjāv½ ±v¾Õ#5 فردی که وظیفه طراحی واگن، اتصالات و ایستگاه برای سیستم ریلی سریع‌السیر را بر عهده دارد و در طراحی‌های خود مشخصات منطقه‌ای و آب‌وهوایی را نیز مدنظر قرار می‌دهد. متخصصان این رسته در سال‌های اخیر با توجه به ظهور این سیستم ریلی در جهان هم‌اکنون نیز مشغول به کار هستند. اما افزایش سرعت و لزوم استفاده از این سیستم در سراسر دنیا تقاضا برای این شغل را افزایش خواهد داد.

۵. **INTERMODAL HUB DESIGNER**$ ôêýÿôú³ ć¹¾z½wí ºþ¯ ćwĄzwă ±v¾Õ): حمل‌ونقل کالا یا مسافر گاهی در شکل‌های زمینی، دریایی و هوایی و یا حتی در حمل‌ونقل زمینی گاهی با ماشین و گاهی با قطار انجام می‌شود. طراحی ایستگاه‌هایی که در آن‌ها این شیوه‌های حمل‌ونقل تعویض می‌شود نقش مهمی در بالا بردن سرعت حمل‌ونقل دارند. این فرد در طراحی هابهای چند کاربردی (سیستم‌هایی برای تغییر انواع حمل‌ونقل)، محاسبه ظرفیت حمل مسافر یا کالا و مقاومت سایشی آن‌ها و ارزیابی پتانسیل رشد آن‌ها تخصص دارد. افزایش جابجایی کالا و مسافر در جهان نیاز به این شغل را نیز افزایش خواهد داد.

۶. **INTERMODAL TRANSPORT TECHNICIAN**$ ć¹¾z½wí ºþ¯ ôêýÿôú³ üĊÆĊþî£#5 ارائه خدمات فنی مرتبط با سازه‌های حمل‌ونقل ناهمگون، هابهای چند کاربردی مسافر و کالا و ایستگاه‌های مربوطه از وظایف این فرد است.

۷. **SMART MANAGEMENT SYSTEM ARCHITECT**$ ºþúÉĀă ¢ĉ¾ĉºù øºÆĊÅ ć½wúÞù#5 توسعه نرم‌افزار برای وسایل نقلیه بدون سرنشین و سیستم‌های مدیریت ترافیک وظیفه این متخصص است. او وظیفه کنترل سیستم‌های مدیریت هوشمند را نیز بر عهده دارد. اگرچه هم‌اکنون راه‌حل‌هایی برای پایش حمل‌ونقل‌های پیچیده وجود دارد، اما در آینده با افزایش نیاز به خودکارسازی سیستم‌های مدیریت ترافیک نیاز به این شغل نیز بیشتر خواهد شد.

۸. **SMART ROAD BUILDER**$ ºþúÉĀă ¿wÅ ā¹w«#5 متخصص در انتخاب و نصب سطوح جاده‌ای تطبیقی است که علامت‌گذاری جاده‌ای با استفاده از شناسایی فرکانس رادیویی، سیستم‌های نظارتی و نصب حسگرهای کنترل شرایط جاده را نیز در نظر می‌گیرد.

۹. **TRANSPORTATION NETWORK SAFETY ENGINEER**$ ôêýÿôú³ Ăî{É Ĉþúĉv Ã ºþĄù#5 فردی حرفه‌ای که در تحلیل و پایش اطلاعات و بررسی تهدیدهای زیست‌محیطی و فناورانه موجود برای شبکه حمل‌ونقل تخصص دارد. این مهندس، برخلاف متخصصان ایمنی ترافیک، به تحلیل مشکلات مرتبط با کارکرد کل شبکه‌های حمل‌ونقل و ارائه راه‌حل برای جلوگیری از آن‌ها می‌پردازد.

Ĉzj ôêýÿôú³

حمل‌ونقل آبی یکی از مهم‌ترین انواع حمل‌ونقل است. اگرچه در دهه گذشته نقش آن تا حدودی کاهش‌یافته است، هنوز هم به‌ویژه در حمل‌ونقل بین‌المللی و بین‌قاره‌ای بخش مهمی از صنعت حمل‌ونقل است. این سیستم در گردشگری نیز نقش مهمی ایفا می‌کند. سیستم چند کاربردی در حمل‌ونقل دریایی پیشرفت کرده است (برای مثال حمل بار تحت یک قرارداد با شیوه‌های حمل متفاوت مانند کشتی و قطار).

سیستم‌های مدیریت هوشمند در این حوزه نیز به کار گرفته می‌شوند و هم‌زمان روی معرفی سوخت‌های جدید و مواد پیشرفته کار می‌شود. تلفیق فناوری‌های فوق در حمل‌ونقل آبی می‌تواند منجر به ظهور مشاغل جدیدی شود.

۱. 5#**ARCTIC NAVIGATION SPECIALIST**$ Ĉ{Öé èÕwþù ½¹ ć¾zÿwý Ì Î ¸¤ù آشنا با ناوبری بر روی یخ در قطب شمال، که قادر است بهترین مسیر را برای یک کشتی ترسیم کرده و در موارد اضطراری به‌سرعت برای تغییر مسیر تصمیم‌گیری کند. این شغل بیشتر برای کشورهای شمالی نظیر روسیه و کشورهای اسکاندیناوی کاربرد دارد.

۲. 5#**MARINE INFRASTRUCTURE SYSTEM ENGINEER**$ Ĉ©wĉ½¹¾ĉ¿ ćv¾z Ĉ¤·wÅ¾ĉ¿ ćwãø¤ÆĉÅ Ì Î ¸¤ù فردی که وظیفه توسعه و پیاده‌سازی فناوری‌ها برای افزایش انعطاف‌پذیری سازه‌ها و کشتی‌ها در مناطق ساحلی را بر عهده دارد تا امکان مقابله با تهدیدها گوناگون (طبیعی یا انسانی) پدید آید. این شغل نیز تحت عنوان فناوری سیستمی زیرساخت زیردریایی وجود دارد، اما پیشرفته‌ای قابل‌توجه فناوری در آینده (به‌ویژه افزایش الزام‌های زیست‌محیطی و تحول سیستم‌های مدیریت هوشمند حمل‌ونقل آبی) الزام‌های این شغل را دگرگون خواهد ساخت.

۳. ¿5#**PORT ECOLOGIST**$ wă½°þz Ã wþÉ ÷Ãz¢ Æĉ¿ پایش و کنترل مشخصه‌های زیست‌محیطی بندرها، کشتی‌ها و فضاهای مرتبط با آن‌ها (آب‌وهوای بندر و مناطق همسایگی آن بعلاوه کلیه گیاهان و جانوران ساکن در منطقه) از وظایف این شغل است. توسعه نرم‌افزار برای بازگرداندن محیطزیست بندرها و آب‌های اطراف آن وظیفه دیگری است که بر عهده این فرد خواهد بود. برخی از دانشگاه‌های کشورهای توسعه‌یافته برای پرورش افراد در این شغل برنامه‌های آموزشی تدوین کرده‌اند.

wÒå

علیرغم فیلم‌های علمی تخیلی نظیر جنگ ستارگان به دلیل عدم پیشرفت چشمگیر در فناوری فضایی این بخش تا حدودی محبوبیت خود را از دست داده است. با این حال امروزه به خاطر موفقیت کسب شده در بخش خصوصی حوزه هوافضا در نقطه عطف خود قرار دارد. گذشته از تعداد اندکی از پیشتازان سفرکرده به فضا، حوزه هوافضا در حال تبدیل شده به بخشی تجاری است که فرصت‌های گسترده‌ای را برای خلق کسب‌وکارهای خصوصی ایجاد می‌کند. برای مثال، در سال ۲۰۲۳، پس از گذراندن دوره آموزشی طولانی و سفری یک‌ساله، گروهی چهار نفره پا بر روی مریخ خواهند گذاشت و هر دو سال این سفر تکرار خواهد شد به‌گونه‌ای که در سال ۲۰۳۵ جمعیت این سیاره به ۲۰ نفر خواهد رسید. ناسا با کمک دارپا قصد دارد سفینه سرنشین دار دیگری را نیز در قرن آینده به سیارات دیگر بفرستد. دنیای کاملاً متفاوتی در این بخش در حال ظهور است که عمدتاً از فناوری‌های دیجیتالی سرچشمه می‌گیرند. کار در این حوزه تخصص‌های بی‌بدیلی را می‌طلبد که به عنوان نمونه برخی از آن‌ها عبارت‌اند از:

۱. 5#**LIFE SUPPORT SYSTEM ENGINEER**$ ¡ wĉ³ ûw{ċ¤Ê~ ø¤ÆĉÅ Ã ºþAù حفظ حیات در فضا وظیفه‌ای خطیر است و سیستم‌های پشتیبان حیات نیاز به تخصص ویژه دارند. وظیفه این فرد پشتیبانی از حیات حتی در شرایط دشوار است.

۲. ¿5#**SPACE BIOLOGIST**$ Ĉĉ©wÒå Ã wþÉ¢ Æĉ¿ این متخصص رفتار سامانه‌های زیستی گوناگون (از ویروس‌ها تا جانوران و انسان) را در فضا مطالعه می‌کند. مطالعه تغییرات فیزیولوژیک و ژنتیکی موجودات زنده، توسعه زیست‌بوم فضایی پایدار برای ایستگاه‌های ماهواره‌ای و پایگاه‌های مستقر در ماه و همچنین حفظ شرایط برای سفرهای طولانی‌مدت نیز بر عهده این تخصص است.

۳. ¿5#**SPACE GEOLOGIST**$ ĈĉwÒå Ã wþÉüċù متخصصی که به اکتشاف و معدن‌کاوی منابع کانی بر روی ماه و سایر سیارات خواهد پرداخت.

۴. 5#**SPACE ROAD ENGINEER**$ ÊĉwÒå āv½ Ã ºþĄù این مهندس به ارائه خدمات در شبکه حمل‌ونقل نزدیک به زمین خواهد پرداخت و مسئولیت طراحی کریدورهای ترافیکی (پرواز در مدار زمین و سفرهای بین‌قاره‌ای با کلاهک‌های بالستیک) را خواهد داشت. با افزایش تعداد پروازها از زمین وظیفه برنامه‌ریزی و هماهنگ‌سازی پرتاب‌ها نیز با این فرد خواهد بود.

۵. 5#**SPACE STRUCTURE LIFE CYCLE DESIGNER**$ ÊĉwÒå ćwăā¿wÅ ¾úÝ Ă·¾¯ ±v¾Õ طراحی سازه‌های فضایی (ایستگاه‌ها، ماهواره‌ها و غیره) بر اساس نیازهای بازسازی و دفع ضایعات از وظایف این متخصص است. به دلیل بهره‌برداری سنگین از فضای نزدیک به زمین و فرض برنامه‌های اسکان انسان بر روی ماه و مریخ این شغل به‌زودی مورد تقاضای فراوانی خواهد داشت.

۶. 5#**SPACE TRAVEL MANAGER**$ ÊĉwÒå ¡ ¾åwÆù ¾ĉºù فردی حرفه‌ای است که برنامه‌های بازدید از فضای نزدیک به زمین (و حتی دورتر) را توسعه می‌دهد. سفر به مجتمع‌های موجود در مدار زمین و سایر سازه‌های فضای (نظیر ایستگاه‌های موجود در ماه) نیز زیر نظر این مدیریت انجام خواهد شد.

Ĉýºþù Üzwþù ć½ÿv¾å ÿ ćÿwíûºþù

تقاضا برای مواد معدنی در دهه‌های آینده همچنان بالا خواهد ماند و به همین دلیل است که این صنعت هنوز هم به نیروی انسانی کیفی نیاز خواهد داشت. برخی عوامل اجزای کلیدی وضعیت کنونی هستند که در آینده تغییرات بیشتری خواهند داشت. مخازن سنتی نفت، گاز و سایر منابع در حال اتمام است و جهان به روش‌های نوین و منابع جدید نیاز دارد. الزام‌های زیست‌محیطی بر حمل‌ونقل و فراوری مواد معدنی تأثیر فزاینده‌ای می‌گذارند. تلاش برای کاهش هزینه‌های تولید مواد معدنی و بالا بردن راندمان تولید ادامه دارد. فناوری‌های بدون سرنشین استخراج و فراوری مواد معدنی را دگرگون خواهند کرد و به دلیل امکان انجام کار از راه دور، جابجایی نیروی انسانی در این حوزه سنتی افزایش خواهد یافت. تمامی این موارد در کنار افزایش اهمیت ایمنی در کارهای مرتبط با معادن، مشاغل نوینی را به بازار عرضه خواهد کرد و ارزش برخی مشاغل موجود را افزایش خواهد داد. مشاغل جدید در این حوزه عبارت‌اند از:

۱. 5#**DISTRIBUTED MINING TEAM COORDINATOR**$ ÊÞĉ¿Ã£ ćÿwíûºþù øĊ£ āºþþí ð þăwúă این فرد وظیفه دارد تا فعالیت‌ها را میان افراد مستقر در محل استخراج یا فراوری و افرادی که از راه دور کار می‌کنند، هماهنگ کند. وظیفه اصلی او تعیین اهداف تاکتیکی، برقراری ارتباط میان اعضای تیم و حل اختلافات و منازعات است.

۲. 5#**ENVIRONMENTAL ANALYST IN MINING INDUSTRIES**$ ûºþù ¢ÞþÍ ½¹ ÊÖĊ´ù¢Æĉ¿ ¾òöĊö´£ متخصص در تحلیل تهدیدهای زیست‌محیطی که موظف است حین فرایند استخراج و بازیافت در مناطق معین از محیط‌زیست محافظت کند.

۳. 5#**MINING SYSTEM ENGINEER**$ ćÿwíûºþù ø¤ÆĊÅ Ã ºþĄù متخصصی که در تأسیسات منابع طبیعی در کل چرخه عمر آن‌ها (از اکتشاف تا حفاظت از منابع طبیعی و بازیابی آن‌ها) کار می‌کند و ماهیت یکپارچه این تأسیسات را در نظر می‌گیرد. برای مثال محل استخراجی ممکن است حاوی میدان‌های نفتی و گازی باشد و ضرورت داشته باشد که فناوری‌های استخراج کاملاً متفاوت این دو منبع طبیعی با یکدیگر هماهنگ شوند. وظیفه این فرد توجه به همه این امور در جهت استخراج بهینه منابع ضمن حفاظت از آن‌ها است.

۴. 5#**ROBOTIC SYSTEM ENGINEER**$ ì Ĉ£wz½ ø¤ÆĊÅ Ã ºþĄù سیستم‌های خودکار پایش، توسعه، تولید و فراوری منابع معدنی (شامل سیستم‌هایی که از راه دور عمل می‌کنند) اهمیت زیادی در صنعت معدن امروز و آینده دارند. این متخصص وظیفه ارائه خدمات فوق و مدیریت این نوع خدمات را بر عهده دارد. این شغل هم‌اکنون وجود دارد و درخواست آن نیز رو به افزایش است.

۵. 5#**TELEMETRIC DATA INTERPRETATION ENGINEER**$ ½ÿ¹ ãv½ ¿v ć¾ĉñã¿vºýv ćwăã¹v¹ ¾ĉÆæ£ Ã ºþAù
فردی متخصص که درگیر تحلیل آرایه‌های داده‌ای دریافت شده از میدان‌ها معدنی است تا بتواند فرایند تولید را کنترل، از حالات اضطراری جلوگیری و به‌سرعت تصمیم‌گیری کند. به‌احتمال‌زیاد این شغل پس از سال ۲۰۲۰ با هوش مصنوعی جایگزین خواهد شد، اما حتی در آن زمان متخصصانی که هوش مصنوعی فوق را راهبری کنند نیاز خواهند بود.

۶. 5#**UNMANNED EXPLORATION AIRCRAFT OPERATOR**$ ĈåwÊ¤ív üĉÊý¾Å ûÿºz ćwăwúĉ~vÃă ½Ã£v¾~v
وظیفه این متخصص کنترل فرایند توسعه و اکتشاف میدان‌ها معدنی جدید با استفاده از هواپیماهای بدون سرنشین مجهز به حسگرهای زمین‌شناسی است. چنین سیستم‌هایی هم‌اکنون در برخی معادن دنیا نظیر کانادا در حال استفاده هستند و نیاز به آن‌ها در آینده افزایش خواهد یافت.

ćÁ½ÃðwQù

متالورژی یکی دیگر از زمینه‌های کاری پراهمیت به‌ویژه در منطقی که منابع معدنی بالایی دارند، است. رقابت در این حوزه کاری رو به رشد است و حرکت به‌سوی فرایندهای تولید ایمن‌تر، به‌کارگیری تجهیزات جدید و بهبود کیفیت فرایندهای فناورانه باعث تغییرات اساسی در آن خواهد شد. استانداردهای تولید در این حوزه ارتقا و به‌سوی متالورژی سفید سوق خواهد یافت. استفاده از روش‌های تولیدی که بر محیطزیست اثر تخریبی کمتری داشته باشند، استفاده از پسماند صنایع متالورژی، کاهش اندازه صنایع متالورژی با توسعه فناوری‌ها، افزایش درخواست‌های مشتریان در خصوص مشخصه‌های محصولات متالورژی، توسعه محصولات نوین مانند نانو پودرها، افزایش سهم بیومتالورژی، تولید آلیاژهای دقیق و بسیاری موارد این صنعت را در تحول و تکاپو قرار داده است و در آینده مشاغل نوینی در این حوزه ظهور خواهند کرد. برخی مشاغل جدید و یا رو به رشد در این صنعت عبارت‌اند از:

۱. 5#**ADVANCED METALS ENGINEER**$ ĂQå¾ÊĈ~ ¡vÀôå Ã ºþAù متخصص در طراحی آلیاژهایی با خصوصیات متغیر از پیش تعیین‌شده که خود در آینده چهره جهان را دگرگون خواهند کرد. این خصوصیات بر اساس شرایط عملیاتی تغییر می‌کنند.

۲. 5#**ECORECYCLER IN METALLURGY**$ ćÁ½ÃðwQù ½¹ ì ĉÁÃðÃív Ĉzwĉ¿wz Ì Î ¸Qù وظیفه این فرد دفع ضایعات متالورژی و بازیافت آن‌ها به‌صورت متناسب با محیطزیست است. این شغل نیز هم‌اکنون وجود دارد و در آینده با توجه به تحول صنعت متالورژی تقاضا برای آن افزایش خواهد یافت

۳. 5#**EQUIPMENT DESIGNER IN POWDER METALLURGY**$ ½¹Ã~ ćÁ½ÃðwQù ¡vÀĉĄ¬£ ±v¾Õ مهندسانی هستند که طراحی و تولید تجهیزات پیشرفته برای تولید فلزات با درجه بالای آمادگی (پودرها و آلیاژها) را بر عهده‌دارند و برای این منظور از فرایندهای بین بخشی (مانند بیومتالورژی) استفاده خواهند کرد.

۴. 5#**EQUIPMENT SUPERVISOR**$ ¡vÀĉĄ¬£ ¢Å¾~¾Å متخصصانی با شایستگی در زمینه‌های مکاترونیک و مهندسی که با تجهیزان فناوری برتر در طول چرخه عمر آن‌ها کار خواهند کرد. هر چه تجهیزات پیشرفته‌تر شوند، هدایت کار با آن‌ها پیچیده‌تر خواهد شد و این وظیفه این سرپرستان است که کار را هدایت کنند.

ć½ÿwSÃýwý ÿ ĂQå¾ÊĈ~ ¹vÃù

پیشرفت فناوری در حال حاضر تقریباً قابل‌تشخیص است، زیرا ما نه‌تنها از مواد سنتی با کارایی بیشتری استفاده می‌کنیم، بلکه در حال خلق مواد جدید با پارامترهای از پیش تعیین‌شده هستیم. این پیشرفت‌ها به بهبود چشمگیر کیفیت محصول، عمدتاً در صنعت هوافضا، مهندسی مکانیک و ساخت‌وساز کمک خواهد کرد. مواد کامپوزیت یا مواد ترکیبی ناهمگون که متشکل از یک جزء تقویت‌کننده و یک ماتریس هستند و بهبود مقاومت، وزن و پلاستیسیتی را نوید می‌دهند، علم مواد با تحولی شگرف روبرو خواهند ساخت. در آینده سازه‌های کامپوزیتی می‌توانند حاوی اجزای هوشمند (کنترل‌گرها و ریزتراشه‌ها) نیز باشند که به کاربر اجازه می‌دهد تا خصوصیات وسیله یا مثلاً اتاق را به وضعی که دوست

دارد تغییر دهد. حاصل این تحولات پدید آمدن محیطزیست فعال (محیط کار، زندگی و مطالعه قابل‌کنترل توسط سیستم‌های هوشمند یا کاربر) خواهد بود که می‌توان آن را بسته به سلیقه شخصی تغییر داد. چنین دنیایی مشاغل جدیدی را طلب خواهد کرد که برخی از این مشاغل عبارت‌اند از:

۱. 5#**Glass engineer**$ ĂÊĆÉ Ã ºþÃù فردی که درزمینهٔ مواد کامپوزیتی با پایه شیشه تخصص دارد. کار او طراحی محصولات شیشه‌ای با استفاده از این دسته از کامپوزیت‌ها است.
۲. 5#**Nanomaterial designer**$ ¹vÃù Ãýwý ±v¾Õ طراحی که قادر است با استفاده از مدل‌های دیجیتالی به مدل‌سازی خصوصیات و پیش‌بینی چرخه عمر نانو مواد بپردازد. این طراح برنامه‌نویسی کاملاً ماهر است که درباره شیمی و فیزیک مواد نانو اطلاعات کافی دارد.
۳. 5#**Recycling technologist**$ ¢åw¢¿wz ć½ÿwþå Ì Î ¸¤ù طراحی، توسعه و پیاده‌سازی فناوری‌های بازیافت در کنار خلق مواد جدید از ضایعات صنعتی و توسعه فرایندهای تولید عاری از ضایعات وظایف این شغل هستند. این حوزه مدت‌هاست موردتوجه قرارگرفته است و با توجه به افزایش جمعیت و لزوم توجه بیشتر به محیطزیست تقاضا برای این شغل روبه افزایش خواهد بود.
۴. 5#**Safety engineer in the nano industry**$ Ãýwý ¢Þþ Í ½¹ Ĉþú¢v Ã ºþÃù متخصص افزایش سطح ایمنی کارکنان، مصرف‌کننده نهایی و محیطزیست در این صنعت است. او وظیفه دارد تا برنامه‌هایی را توسعه دهد که واکنش سریع در برابر اثرات منفی تولید و مصرف نانو مواد را ممکن سازند.
۵. 5#**Smart material designer**$ ºþúÉÃă ¹vÃù ±v¾Õ فردی که مسئولیت طراحی مواد کامپوزیت در درون محیط‌های هوشمند را بر عهده دارد. خصوصیات این مواد بر اساس وظیفه‌ای که در منزل، محل کار یا محیط صنعتی دارند، تغییر می‌کند.
۶. 5#**System engineer of composite materials**$ ¢ĉ¿Ã ùwí ¹vÃù ø¤ÆĆÅ Ã ºþÃù متخصصی که مواد سنتی مورداستفاده در ساخت‌وساز، مهندسی مکانیک، رباتیک، پزشکی و غیره را با مواد جدید جایگزین می‌کند. این فرد متخصص مواد پیشرفته را بر اساس الزام‌های صنایع مصرف‌کننده و با توجه به خصوصیاتی مانند مقاومت به سرما، میزان تردی موردنیاز، دوام، عدم حساسیت‌زایی و غیره طراحی می‌کند.

ì Ć£wz½ ÿ ì Ćýwîù Ã ºþÃù

ازآنجا که فنون ساخت ربات به شکل چشمگیری رشد کرده، ارزان‌تر شده و در حوزه هوش مصنوعی توجه فراوانی را به خود جلب کرده است، ایده‌ای که مدت‌های مدیدی به داستان‌های علمی تخیلی تعلق داشت ممکن است در آینده نزدیک محقق شود. بر اساس تحقیقات انجام‌شده توسط شرکت سیسکو تعداد ربات‌های خانگی تقریباً هر نه ماه یک‌بار دو برابر می‌شود و در دهه ۲۰۲۰ ربات‌ها به بخشی از تجهیزات داخلی آپارتمان‌های مسکونی در مناطق شهری تبدیل خواهند شد. حتی مدل‌هایی در حال ساخت هستند که می‌توانند از افراد مسن مراقبت کنند. چنین دنیای پیشرفته‌ای به متخصصانی جدید و مشاغلی نوین نیاز خواهد داشت.

۱. 5#**Household robot designer**$ Ĉòýw· ćwă ¡ wz½ ±v¾Õ متخصصی که وظیفه طراحی و برنامه‌نویسی ربات‌های خانگی نظیر پرستار بچه، تمیزکننده، شوینده، باغبان و غیره را بر عهده خواهد داشت. این ربات‌ها با سایر اجزای خانه هوشمند یکپارچه‌شده و قادرند به اطراف حرکت کرده و کارهای پیچیده خانه را انجام دهند.
۲. 5#**Industrial robot designer**$ Ĉ¤þÍ ćwă ¡ wz½ ±v¾Õ این فرد متخصص در طراحی دستگاه‌های رباتیک مناسب ساخت تولید (نقاشی، جوشکاری، بسته‌بندی و مهر زدن)، دستگاه‌های لجستیک صنعتی (لودر، جابجا کننده و غیره) و سیستم‌های رباتیک متشکل از این دستگاه‌ها (کارخانه‌های چراغ خاموش). مشاغل مربوط به این بخش هم‌اکنون نیز وجود دارند و در آینده رشد خارق‌العاده‌ای خواهند داشت.

۳. **Medical robot designer** فردی که در این شغل کار می‌کند وظیفه طراحی دستگاه‌ها و سیستم‌های رباتیک زیست سازگار پزشکی و زیست‌فناوری که کاربردهای گسترده‌ای دارند. ربات‌های جراح، تشخیص‌دهنده و پروتزهای رباتیک نمونه‌هایی از کار این شغل است.

۴. **Multi-purpose robotic systems designer** کنترل و خدمت‌رسانی به سیستم‌های رباتیک، ازجمله آن‌هایی که در تأسیسات پیچیده و خطرناک استفاده می‌شوند و با اهداف دور از دسترس یا میکروسکپی سروکار دارند از وظایف این متخصص است. این شغل هم‌اکنون وجود دارد و در آینده نیاز به شاغلین این بخش برای طراحی و تعمیر و نگهداری این سیستم‌ها بیشتر نیز خواهد شد.

۵. **Children's robot designer** متخصصی که با طراحی انواع اسباب‌بازی و سایر ابزار و اجناس بچگانه بر اساس ربات‌های قابل‌برنامه‌ریزی سروکار دارد و موظف است ویژگی‌های روانی و فیزیولوژیک بچه‌ها را در نظر داشته باشد.

۶. **Composite engineer** انتخاب مواد کامپوزیت برای ساخت قطعات، سازوکار و اتصالات دستگاه‌های رباتیک با خواص از پیش تعیین‌شده و با استفاده از پرینت سه‌بعدی وظیفه این متخصص است.

۷. **Designer of neural interfaces for robot control** متخصصی است که سیستم‌های کنترلی را برای ربات‌های صنعتی و جنگی طراحی می‌کند. طراحی او بر اساس رابط‌های عصبی است که کنترل توسط تیمی از اعضا و یا تنها یک فرد را ممکن می‌سازد.

۸. **Ergonomic designer** فردی است که طراحی سیستم‌های رباتیک با توجه به الزام‌های ارگونومیک کاربر وظیفه او است. او در طراحی خویش باید وضعیت روانی و فیزیکی کاربر را در نظر بگیرد.

ì{Å ¢Þþí

محصولات این صنعت در تمامی بخش‌های زندگی بشر کاربرد دارند. از زندگی عمومی در منزل تا صنایع سرگرمی و مد که نقش مهمی را در جهان ایفا می‌کنند. پیشرفت در حوزه الیاف مصنوعی و الیاف هوشمند فناوری برتر که منجر به تولید انواع بسیار جذابی از لباس یا کفش شده است (خود تمیز شونده، فلوئورسنت و یا با توان جذب انرژی خورشیدی)، ظهور محصولات ژنتیکی در تولید الیاف خاص، شخصی‌سازی لباس و امکان ایجاد کارخانه‌های کوچک برای تولید لباس‌های خاص، خیاطی سفارشی آنلاین و رشد چاپ سه‌بعدی همگی روندهایی هستند که آینده صنایع سبک را دگرگون خواهند ساخت و به دلیل همین پیشرفت‌ها مشاغل نوینی نیز در این حوزه‌ها در حال ظهور یا رشد است.

۱. **Advanced fabrics designer** متخصص درگیر در طراحی الیاف یا مواد مصنوعی جدید با خواص از پیش تعیین‌شده (برای مثال پارچه‌های LED یا پارچه‌های دارای حافظه).

۲. **Clothes 3d model programmer** نوعی متخصص فناوری اطلاعات است که طرح اولیه طراحان لباس را به دستورالعمل‌هایی برای یک ربات یا یک پرینتر سه‌بعدی تبدیل می‌کند. در آینده کاربران قادر خواهند بود که از این طرح‌ها برای پرینت لباس‌های خودشان استفاده کنند و یا آن‌ها را به خیاط خودکار نزدیک منزل برده و لباس موردنظرشان را تهیه کنند.

۳. **Clothes recycling specialist** فردی آشنا با زیست‌بوم شناسی و علم مواد که روش‌های بهینه برای بازیافت و استفاده مجدد از لباس‌های کهنه را توسعه می‌دهد.

۴. **Healthy clothes expert** کنترل ساخت لباس ازنظر مزایای ایمنی و بهداشتی (عایق حرارتی، تهویه هوا و غیره) و طراحی لباس‌های پزشکی نظیر پارچه‌های حاوی مواد ضدعفونی‌کننده از وظایف این فرد است.

۵. **IT interface designer for light industry** این متخصص نرم‌افزارهای مناسب را برای طراحی لباس‌ها، الگوها و اتاق‌های پرو مجازی توسعه می‌دهد.

۶. 5#**Techno-stylist**$ ć½ÿwþå ºù Ì Î ¸¤ù متخصصی در محل تلاقی طراحی و فناوری اطلاعات است که لباس‌ها را با ابزارهای الکترومکانیکی پوشیدنی ترکیب می‌کند. این ترکیب ممکن است به‌عنوان تزئین و یا برای مقاصد خاص انجام شود. برای مثال نوعی پیراهن طراحی کرده‌اند که اگر شما هنگام پوشیدن آن خود را بغل کنید و هم‌زمان فرد دیگری نیز لباس مشابهی تنش باشد، بغل کردن شما را احساس خواهد کرد. تنوع‌طلبی مشتریان و امکان پیشرفت در این حوزه تقاضا برای این‌گونه متخصصان را افزایش خواهد داد.

ûwí¹Āí ¡wùº·ÿ ¡đĀÎ´ù

محصولات و خدمات مرتبط با کودکان بخش مهمی از زندگی اجتماعی است. آنچه کودکان امروز بازی می‌کنند بر علایق، ارزش‌ها و ادراک آن‌ها از جهان پیرامون در آینده تأثیر می‌گذارد. این بدان معناست که هر چه برای بازی کودکان ساخته می‌شود باید در وهله اول هدف آموزشی داشته باشد. صنعت کودکان تا همین اواخر صنعتی مستقل نبود. برای مثال مبل مخصوص کودکان را مبل‌سازان تهیه می‌کردند و غذای کودکان در صنایع غذایی و لباس کودکان توسط صنایع سبک تهیه می‌شد. این وضعیت به سمتی می‌رفته که بسیاری مواقع نیازهای کودکان نادیده گرفته می‌شد. اما از سال ۲۰۱۳ به‌ویژه در آمریکا صنعتی مستقل برای کودکان ظهور کرد. چندین فرایند مهم اکنون در این صنعت اتفاق می‌افتد. اولین اتفاق رسانه سازی است. ۹۰ درصد محصولات تولیدی در این صنعت بر اساس شخصیت‌های محبوب کودکان و داستان‌های مرتبط با آن‌ها ساخته می‌شوند. این روش بر ارزش‌ها و استانداردهای رفتاری کودکان تأثیر می‌گذارد. اتفاق دوم اتخاذ استراتژی جدید برای اسباب‌بازی سازی است. در این استراتژی محصولات آموزشی به‌صورت مادام‌العمر خلق می‌شوند، در تمامی رسانه‌ها حضور پیدا می‌کنند و به‌تدریج با رشد کودکان بزرگ‌شده و به رشد او کمک می‌کنند. مشاغل جدید این حوزه عبارت‌اند از:

۱. 5#**CHILDREN'S FUTURE IMAGE EXPERT**$ ûwí¹Āí āºþĉj ¾¢ĀÎ£ Ì Î ¸¤ù این متخصص درگیر شکل‌دهی به تصویر محتمل زندگی آینده کودک و تعیین مسیر پرورش آن بر اساس آرزوهای والدین و توانایی‌ها و ادراکات خود کودک است. او برنامه‌های آموزشی (هنر، ورزش و غیره)، بازی‌ها و نرم‌افزارهای متناسب با این تصویر آینده را برای کمک به خبرگی کودک در مهارت‌هایی که پیش‌بینی‌شده است، تعیین می‌کند.

۲. 5#**CHILDREN'S PSYCHOLOGICAL SECURITY SPECIALIST**$ ûwí¹Āí Ĉývÿ½ ¢ĉþùv Ì Î ¸¤ù فرد شاغل در این حرفه موظف است محصولات و خدمات گوناگون مرتبط با کودکان (اسباب‌بازی، بازی‌های دیگر، کارتن‌ها، لباس‌ها، مبلمان و غیره) را ازنظر میران تهدید روانی یا آسیب بالقوه به‌سلامت روانی کودک مورد آزمایش قرار دهد. او بر اساس نتایج آزمایش‌هایش در خصوص اصلاح روش ساخت یا کاربردهای این محصولات و خدمات توصیه‌های لازم را ارائه می‌دهد.

۳. 5#**CHILDREN'S R&D MANAGER**$ ûwí¹Āí ĂÞÅĀ£ÿ èĉê´£ ¾¢ºù متخصصی است که فعالیت‌های خلاقانه کودکان را در جهت ابداع محصولات کودکانه جدید سازمان‌دهی می‌کند و ایده‌های کودکان را با امکان تولید انبوه منطبق می‌سازد. گاهی اوقات کودکان قادرند نسبت به هر تیم طراحی دیگری متشکل از بزرگ‌سالان است راه‌حل‌های طراحی جذاب‌تری را ارائه دهند. چنین فعالیت‌هایی به‌صورت پراکنده در جهان امروز نیز در حال انجام است، اما با توجه به اهمیت آموزش کودکان در آینده اهمیت این شغل افزایش خواهد یافت.

۴. 5#**TRANSMEDIA PRODUCT DESIGNER**$ ćvĂýwÅ½ºþ¯ Ĉĉv¾Åûw¤Åv¹ ¡đĀÎ´ù ±v¾Õ داستان‌سرایی چندرسانه‌ای در چند سال اخیر جای خاصی در دنیای بازی‌های کودکانه بازکرده است. این شیوه آموزشی جذاب در آینده نیز رو به رشد خواهد بود. این فرد درگیر طراحی محتوا (شخصیت‌ها، داستان‌ها، درگیری‌ها، مشکلات، محتوای آموزشی) و ارائه خدمات هم‌زمان به چندین رسانه جمعی (برنامه‌های تلویزیونی، بازی‌ها، و غیره) خواهد بود. وی باید قادر به ایجاد سیستمی منسجم از تعامل بین فرمت‌های مختلف (انطباق تصاویر شخصیت‌ها و همبستگی / سازگاری داستان‌های مربوط به آن‌ها) باشد.

¡ wÝĒÕv ć½ÿwþå È ¸z

فناوری اطلاعات یکی از سریع‌الرشدترین بخش‌های اقتصاد است و تغییراتی که در این بخش اتفاق می‌افتد فرصت‌های جدید و غیرقابل‌باوری را در حوزه‌های طراحی، حمل‌ونقل، مدیریت منابع و نیروی انسانی، بازاریابی و آموزش پدید آورده است. ارتباطات از راه دور، ارائه راه‌حل‌های دیجیتالی، افزایش شدید حجم داده‌ها، وسایل و نرم‌افزارهایی که در حوزه‌های مختلف به بشر کمک می‌کنند، مقابله با حملات سایبری، واقعیت مجازی نمونه‌هایی از این تحولات هستند که هرروزه در حال دگرگون کردن زندگی انسان‌ها هستند. در این حوزه هم‌اکنون مشاغل متعددی ظهور کرده‌اند و در آینده نیز چنین رشدی وجود خواهد داشت. نمونه‌ای از مشاغل جدید و یا رو به رشد در این بخش عبارت‌اند از:

۱. 5#**BIG DATA MODEL DESIGNER**$ wăā¹v¹ ¾zv óºù ±v¾Õ متخصصی است که طراحی سیستم‌هایی برای جمع‌آوری و پردازش آرایه‌های بزرگ داده‌های دریافتی از اینترنت را بر عهده دارد. توسعه مدل‌های تحلیلی و واسطهای گردآورنده این داده‌ها نیز از وظایف این متخصص خواهد بود.

۲. 5#**CYBER DETECTIVE**$ ć¾{ĉwÅ āwñj½wí این فرد متخصص تحقیق در مورد جنایات اینترنتی است. او در علوم جنایی، تحقیق (کارآگاهی مدرن)، جستجو (ازجمله جستجو فعالانه از طریق حملات سایبری رسمی علیه مظنونین) و پردازش اطلاعات در اینترنت (تحلیلگر داده‌ها با مهارت‌های برنامه‌نویسی) تخصص دارد. کارآگاهان سایبری، در حقیقت، هم‌اکنون نیز وجود دارند و تقاضا برای آن‌ها در آینده حتماً رشد خواهد کرد.

۳. 5#**DIGITAL LINGUIST**$ Ĉõw¤Ċ¬ĉ¹ Ã wþÉûwz¿ فردی حرفه‌ای است که سیستم‌های زبان‌شناختی را برای ترجمه معنایی (ترجمه با توجه به زمینه و سایه‌های معنی) و پردازش اطلاعات متنی (ازجمله جستجو معنایی در اینترنت) توسعه می‌دهد. او همچنین واسطهای ارتباطی جدید بین انسان و کامپیوتر را با استفاده از زبان‌های طبیعی توسعه می‌دهد.

۴. 5#**INFORMATION SECURITY SUPERVISOR**$ ¡ wÝĒÕv ¢ Ċþùv ¢ Å¾~¾Å این شخص متخصص امنیت اطلاعاتی فرایندهای فناورانه تأسیسات صنعتی خودکار است. این سرپرست امنیت، حفاظت و پایداری عملیات سیستم‌های مدیریت فرایند را با تمرکز بر ردیابی هر نوع نقطه‌ضعف جدید تضمین می‌کند.

۵. 5#**INFORMATION SYSTEMS ARCHITECT**$ Ĉ£wÝĒÕv ćwăø¤ÆĊÅ ½wúÞù فردی باصلاحیت برای طیف گسترده‌ای از عملیات مرتبط با سیستم‌های پردازش داده‌ها است که به‌طور ویژه پایگاه داده طراحی می‌کند، الگوریتم اقدام توسعه می‌دهد، دسترسی اثربخش کاربران به ذخیره داده‌ای را تضمین می‌کند و کیفیت و منطق ذخیره و استخراج داده‌ها را کنترل می‌کند. چنین شغلی هم‌اکنون در جهان موردنیاز است و در آینده با نفوذ فناوری اطلاعات به همه حوزه‌های فعالیت‌های انسانی نیاز به آن افزایش خواهد یافت.

۶. 5#**INTERFACE DESIGNER**$ ÔÅvÿ ±v¾Õ توسعه واسطهای ایمن، سازگار و متناسب کاربر برای تجهیزات، دستگاه‌ها و نرم‌افزار در سطوح گوناگون وظیفه این متخصص است. او در خلق واسطهایی که برای کاربران راحت‌ترین شرایط را ایجاد می‌کنند، مهارت بالایی دارد. طراح واسط شغلی موجود و محبوب است که در آینده با افزایش شدت تعامل انسان و ماشین محبوبیت بیشتری نیز خواهد یافت.

۷. 5#**IT AUDITOR**$ ¡ wÝĒÕv ć½ÿwþå ÀĊúù این فرد درزمینهٔ توسعه نرم‌افزار تخصص دارد. ممیزی سیستم‌های پیچیده فناوری اطلاعات، پردازش داده‌ها و ایجاد پایگاه تصمیم‌گیری بر اساس این داده‌ها وظیفه این شخص است. خطا یا انحراف چنین سیستم‌هایی آن‌چنان پرخطر است که ممیزی آن‌ها از دیدگاه امنیت نرم‌افزار روزبه‌روز اهمیت بیشتری پیدا خواهد کرد.

۸. 5#**IT PREACHER**$ ¡ wÝĒÕv ć½ÿwþå yĊÖ· متخصص برقراری ارتباط با مصرف‌کننده نهایی محصولات فناوری اطلاعات است که از طریق مکالمات برانگیزاننده درباره فناوری‌های پیشرفته افراد ملاحظه‌کار را به استفاده از راه‌حل‌های جدید ترغیب می‌کند. خطیب فناوری اطلاعات به مردم خواهد آموخت تا از نرم‌افزار و خدمات جدید برای کاهش شکاف‌های دیجیتالی استفاده

کنند. فعالیت‌های مربوط به آموزش مردم هم‌اکنون نیز تحت عنوان سوادآموزی دیجیتالی به‌صورت داوطلبانه در حال اجراست اما در آینده نزدیک به شغلی واقعی تبدیل خواهد شد.

۹. Ĉ{ÎÝ ćwăÔÅvÿ ±v¾Õ 5#**NEURAL INTERFACE DESIGNER**$ متخصصی که برای کنترل کامپیوترها و رباتهای خانگی و صنعتی واسطهای سازگار با سیستم عصبی انسان طراحی می‌کند. او در این کار ویژگی‌های فیزیولوژیک و روانی کاربر را در نظر خواهد گرفت. امروز واسطهای عصبی بیشتر برای تفریح استفاده می‌شوند. در آینده کاربردهای این واسطها برای استفاده از دستگاه‌های بسیار پیچیده به‌شدت گسترش خواهد یافت.

۱۰. üĉĒÿj ôĊíÿ 5#**ONLINE LAWYER**$ فردی که درگیر شکل‌دهی به تعاملات حقوقی بر روی اینترنت (ازجمله در جهان‌های مجازی) و ایجاد سیستم‌های حمایتی قانونی برای افراد و اموال در اینترنت (شامل اموال مجازی) است.

۱۱. Ĉ Î ¸ É ôĉwåÿ¾~ Ĉ¤Ċþùv ½ÿwÊù 5#**PERSONAL PROFILE SECURITY ADVISOR**$ ارائه مشاوره درزمینهٔ امنیت اطلاعات به کاربران اینترنت وظیفه این فرد است. او تصویر اطلاعات فعلی مشتری را بر اساس تمام اطلاعات موجود در اینترنت گردآوری و فعالیت‌های مشتری در اینترنت را ازنظر نقاط ضعف، محرمانه بودن و امنیت عمومی بررسی می‌کند. این فرد در صورت درخواست مشتری، نقاط ضعف او را حذف، اطلاعات کاربر در اینترنت را ویرایش (یا حذف) و تصویر اطلاعات مشتری را پیکره‌بندی می‌کند.

۱۲. üĊÆĊþî£ Ĉ¤ÿ¾¤þĉv ÔĊ´ù ºþúÉĀă 5#**SMART ENVIRONMENT CYBER TECHNICIAN**$ متخصصی که وظیفه او پرداختن به سطوح پایین زیرساخت اطلاعاتی و تضمین امنیت بخش‌های اختصاصی شبکه در همین سطوح است.

Ĉõwù ½Āùv

بخش امور مالی سیستمی در درون نظام اقتصادی است که به توزیع مجدد سرمایه و تخصیص آن به پروژه‌های مرتبط‌تر با بازار کمک می‌کند. روند کلی در اقتصاد نوین بر کاهش واسطهای انسانی در این بخش تمرکز دارد که با سیستم‌های خودکار جایگزین خواهند شد. به همین دلیل بسیاری از مشاغل نظیر حسابداری یا دفترداری در مخاطره بوده و نهایتاً ناپدید خواهند شد. اما مباحث مالی گسترده و جدیدی در حال ظهور هستند که افراد متخصصی برای آن‌ها باید پرورش یابند. بعلاوه اینترنت خود منشأ ابزارهای مالی نوینی نظیر سرمایه‌گذاری جمعی و پول نقد دیجیتالی که توجه فراوانی را به خود جلب کرده است. این تحولات مشاغل جدیدی را ایجاد خواهند کرد.

۱. ¾ĉºù ÷½Āæ£Ē~ ć½v¼ñĂĉwù¾Å ÿ üĊùm£ Ĉõwù ĈÞú« $ **CROWDFUNDING AND CROWD INVESTING PLATFORM MANAGER**#5 مدیریت و سازمان‌دهی عملیات پلاتفورمهای تأمین مالی جمعی، اجرای ارزیابی مقدماتی پروژه‌ها برای دریافت تأمین مالی جمعی و حل منازعات میان سرمایه‌گذاران و مالکان پروژه‌ها از وظایف این شغل است. این روش کار در برخی کشورهای پیشرفته صنعتی وجود دارد، اما هنوز در سایر کشورها توسعه‌نیافته است. به دلیل اهمیت تأمین منابع مالی برای پروژه‌های متعدد کوچک و بزرگ در سراسر جهان این شغل در آینده موردنیاز جدی خواهد بود.

۲. ¢ĉ¾ĉºù çÿºþÍ ć½v¼ñĂĉwù¾Å ćÿ½ wă¹vºÞ¤Åv 5#**DIRECT TALENT INVESTMENT FUND MANAGER**$ متخصصی است که ایجاد سبدی از افراد حرفه‌ای با استعداد را سازمان‌دهی می‌کند. پشتیبانی از مسیرهای آموزشی و پیشرفت شغلی آن‌ها در جهت بیشینه شدن درآمد این افراد و در نهایت درآمد صندوق نیز از وظایف این فرد است. این شغل معادل مدیر برنامه ورزشکاران و هنرپیشه‌ها خواهد بود.

۳. xwĉ¿½v ¢ĊÎõwù ćĀþÞù 5#**INTELLECTUAL PROPERTY APPRAISER**$ مالکیت معنوی از مباحث مطرح در تمامی اعصار است که در آینده با توجه به تحولات فناوری و افزایش شدت نوآوری و تنوع آن رد حوزه‌های گوناگون اهمیت بیشتری نیز پیدا خواهد کرد. وظیفه این فرد ارزیابی دارایی‌های نامحسوسی مانند ایده‌ها، مدل‌های کسب‌وکار، ابداعات و اختراعات، فناوری‌های

اجتماعی و غیره خواهد بود. برای مثال در روسیه در سال ۲۰۱۴ ۱۴ تقاضا برای این عنوان شغلی وجود داشت درحالی‌که تنها ۲ نفر توانایی احراز شغل را داشتند.

۴. MULTICURRENCY TRANSLATOR متخصصی است که سیستم‌های تبادل ارز سنتی، شایسته و جایگزین را در کنار هم سازمان‌دهی می‌کند. اگرچه خدمات آنلاین برای بحث‌هایی نظیر تبدیل واحد پول اینترنتی (Bitcoin) به سایر ارزها و جریان یافتن آن‌ها در سیستم بانکی وجود دارد، اما دولت‌ها به دلیل دشواری کنترل این نوع جریان نقدینگی هنوز نسبت به آن نگران هستند. بااین‌وجود فرایند فوق در حال رشد است و در آینده با توجه به تحولات دنیای دیجیتالی رشد بیشتری نیز خواهد داشت.

۵. PERSONAL PENSION PLAN DESIGNER افزایش مشاغل آزاد باعث شده است تا افراد بیشتری خارج از سیستم بازنشستگی معمول دولت‌ها قرار بگیرند و این افراد برای بازنشستگی نیاز به برنامه‌های خاص خوددارند. این فرد در توسعه مدل‌های سرمایه‌گذاری شخصی در صندوق‌های بازنشستگی و یا استفاده از سایر ابزار مالی تخصص دارد. طراحی او بر اساس درآمد، نوع شغل، سبک زندگی و انتظارات سنی فرد انجام خواهد شد.

¢ĉ¾ĉºù

مدیریت شغلی مستقل نیست اما مدیران حرفه‌ای در همه بخش‌های اقتصاد وجود دارند. بسیاری از تخصص‌های مدیریتی فرابخشی هستند که یعنی مدیرانی حرفه‌ای می‌توانند آزادانه در بخش‌های گوناگون کار کنند. فرایندهای تولید در آینده پیچیده‌تر خواهند شد و به‌موجب آن تقاضا برای نیروهای توانمند در سازمان‌دهی مهارت‌ها افزایش خواهد یافت. در سوی مقابل، خودکارسازی راه‌حل‌ها انقلابی را در حوزه مدیریت به وجود آورده است. هدف این تحول انقلابی در آینده یافتن سازوکارهای مدیریتی توزیع یافته خواهد بود، یعنی افرادی با توانمندی برپا سازی تیم‌های پراکنده و متحرک از افراد حرفه‌ای برای پروژه‌های خاص و ایجاد هماهنگی میان آن‌ها. کار از راه دور و نیمه‌وقت افراد متخصص بیشتر و بیشتر خواهد شد و این افراد تخصص خود را برای کار هم‌زمان در چند پروژه صرف خواهند کرد. گذشته از این موارد تغییرات اجتماعی و تغییرات در عادات مصرف سریع‌تر خواهد شد و بنابراین تیمهای مدیریتی باید به‌طور مستمر به تحلیل روندهای جدید بپردازند. تمامی این تغییرات نظام مدیریتی و درنتیجه مشاغل مرتبط با آن را دچار تحول خواهد کرد. برخی مشاغل آینده که مرتبط با این حوزه هستند عبارت‌اند از:

۱. COMMUNITY DEVELOPMENT PLAN COORDINATOR فردی حرفه‌ای درگیر در سازمان‌دهی و پشتیبانی از گفتگو میان تیمهای مستقل تولیدکننده است که به هم‌ترازی اهداف بلندمدت آن‌ها با توجه به تصویر مشترک از آینده کمک می‌کند. کمک به این تیم‌ها برای تعریف برنامه‌های سرمایه‌گذاری مشترک برای تأسیس امکانات تولیدی و جذب نیروی انسانی از دیگر وظایف این فرد است. مدیران آینده باید فعالیت‌های تیم‌های پروژه مختلف که اعضای آن‌ها در کشورهای متفاوتی مستقر هستند را هماهنگ کنند.

۲. CORPORATE ANTHROPOLOGIST مطالعه بازار محصولات نوآورانه شرکت‌ها با استفاده از روش‌های انسان‌شناسی وظیفه این فرد است. او همچنین وظیفه دارد ارتباط میان شرکت و مخاطبان هدف را ارتقا بخشد. این شغل در کشورهای غربی تا حدودی ایجادشده است و عموماً شرکت‌های فناوری اطلاعات مانند اینتل و نوکیا اقدام به جذب چنین نیروهایی می‌کنند. رقابت آینده اهمیت این شغل را افزایش خواهد داد.

۳. CORPORATE VENTURE FUND PORTFOLIO MANAGER متخصصی است که سرمایه‌گذاری شرکت‌ها بر روی استارت آپ های ایجادشده بر اساس ایده‌های کارکنان را با هدف توسعه خطوط تولید شرکت مدیریت می‌کند. او از رشد این گروه از استارت آپ ها از مفهوم تا تولید حمایت می‌کند. صندوق قرارداد مخاطره‌آمیز شرکتی به شکلی مستمر به دنبال راه‌حل‌های نویدبخش خواهد بود.

۴. 5#**CROSS-CULTURAL COMMUNICATION MANAGER**$ Ôòþă¾å ûwĉù ¡ wÕw{£½v ¾ĉºù وظیفه این فرد حفظ جریان مستندات زبان خارجی شرکت، کنترل پیام‌های کلیدی (برای مثال در انتخاب شعارهای بازاریابی)، آموزش کارکنان برای ارسال پیام‌هایشان به زبان خارجی و توجه به مشخصه‌های فرهنگی در مذاکرات با شرکای خارجی است. ارائه مشاوره به شرکت‌ها در خصوص کسب‌وکار در کشورهای خارجی از دیگر وظایف این فرد است.

۵. 5#**ENVIRONMENT AUDITOR**$ ¢Æĉ¿ÔĈ´ù ÀĈúù فردی است که با ممیزی تأسیسات صنعتی و ارائه مشاوره به آن‌ها برای کاهش ردپاهای زیست‌محیطی سروکار دارد. اگرچه این شغل نسبتاً قدیمی است، اما به دلیل عدم شفافیت مسائل قانونی و سیاست‌های زیست‌محیطی تاکنون نافرجام بوده است. با رشد صنایع و بهبود قوانین نیاز به این شغل افزایش خواهد یافت.

۶. 5#**INDIVIDUAL FINANCIAL TRAJECTORY DESIGNER**$ ć¹¾å Ĉẅù ¾ĈÆù ±v¾Õ محاسبه مدل‌های سرمایه‌گذاری فردی بر اساس درآمد و هزینه‌های پیش‌بینی‌شده، ارائه توصیه برای طرح‌ریزی بودجه‌های فردی و خانوادگی و مشاوره درزمینهٔ پیشرفت شغلی ازجمله وظایف این فرد است. با توجه به این حقیقت که در آینده افراد متخصص بیشتری قادر خواهند بود تا به‌صورت پاره‌وقت و در پروژه‌های متعدد (ازجمله در کشورهای خارجی) کار کنند و همچنین منابع کسب درآمد متنوع‌تر خواهند شد نیاز به این شغل افزایش خواهد یافت.

۷. 5#**ONLINE SALES MANAGER**$ ü¢Ē½j Çÿ¾å ¾ĉºù شغلی قدیمی که انتظار می‌رود با رشد اینترنت و جهان دیجیتالی رشد بیشتری نیز داشته باشد. وظیفه این فرد ارتقای سازوکارهای تبلیغ محصولات بر پایه اینترنت، پشتیبانی از فروشگاه‌های آنلاین، سازمان‌دهی کمپین‌های بازاریابی روی اینترنت و یا کار با شرکت‌های شریک برای بهبود خدمات مشتریان است.

۸. 5#**PERSONAL BRAND MANAGER**$ ĈÎ¸É º½¾z ¾ĉºù او با استفاده از شبکه‌های اجتماعی و سایر پلاتفورمهای عمومی به شکل‌دهی تصویر شخصی بر اساس اهداف و الزام‌های مشتریان خواهد پرداخت. ساخت برند شخصی یکی از جنبه‌های بااهمیت مربیگری کسب‌وکار نوین است. تصویری متناسب با مخاطب خاص هدف کمک خواهد کرد تا فرد در میان انبوه متخصصان مشابه برجسته‌تر دیده شود و درزمینهٔ کاری خاص خویش به رهبری عمومی تبدیل شود.

۹. **PRODUCTION COORDINATOR IN DISTRIBUTED** $ äû¤¸ù ÜùwÃ« ½¹ ºûÃ£ ãºþþíðþăwúă 5#**COMMUNITIES** فردی است که سفارش را گرفته و فعالیت‌های تیم‌های مستقلی را که برای طراحی، ساخت و مونتاژ محصول در یک مجموعه صنعتی کار می‌کنند، مدیریت می‌کند.

۱۰. 5#**TIME BROKER**$ ûwù¿ ½vÀñ½wí متخصصی است که ساعات کاری متخصصان آزادکار را معامله می‌کند. به عبارت دیگر استخدام افراد را در بازار آزاد مدیریت می‌کند. هر جند پدید آمدن سیستم‌های خودکار در آینده دور منجر به ناپدید شدن این شغل خواهد شد، اما در آینده نزدیک به دلیل افزایش آزادکاران (کسانی که به‌صورت آزاد برای کارفرمایان کار می‌کنند) تقاضا برای این شغل افزایش خواهد یافت.

۱۱. 5#**TIME MANAGER**$ ûwù¿ ¾ĉºù مدیریت زمان اهمیت فراوانی در حال و آینده دارد و این فرد متخصص برنامه‌ریزی زمان کاری تیم‌ها و افراد است به‌گونه‌ای که امکان بهره‌برداری اثربخش از زمان به وجود بیاید. بهینه‌سازی تخصیص زمان برای جذب فرصت‌های نوظهور فناوری از وظایف این فرد خواهد بود.

۱۲. 5#**TREND WATCHER / FORESIGHTER**$ wă°ýÿ½ ćÃòÊĉ- wĉ ¾ñã½wÚý فردی است که با ردیابی ظهور روندهای جدید در شاخه‌های مختلف اقتصادی، زندگی اجتماعی، سیاست و فرهنگ، گزارش‌هایی را درباره تأثیر روندهای جدید بر نیازهای مشتریان تهیه می‌کند. در آینده دور، توانایی کار با تصاویر آینده به‌نوعی شایستگی زیرکانه برای هر مدیر تبدیل خواهد شد.

۱۳. 5#**USER COMMUNITY MODERATOR**$ ¾z½wí ćwăúú¬ýv ¾ĉºù فردی که وظیفه او سازمان‌دهی انجمن‌های آنلاین کاربر، پشتیبانی از او در گفتگو با طراحان محصول شرکت برای توسعه خط تولید و حفظ وفاداری کاربران است.

۱۴. 5#**VIRTUAL LAWYER**$ ć¿w¬ù ôĊíÿ فردی است که از راه دور و از طریق اینترنت پشتیبانی حقوقی انجام می‌دهد. برای مثال، درباره هنجارهای قانونی کشوری که کسب‌وکار در آن در حال انجام است مشاوره می‌دهد و در این زمینه کشور محل کار وکیل مهم نیست.

ĈÝwú¤«v È ¸z

بخش محافظه‌کار و سنتی خدمات عمومی و اجتماعی به دلیل پیشرفت‌های فناوری اطلاعات در حال تجربه کردن تحول شگرفی هستند. این تنها آغاز سفری طولانی است. شفافیت، درگیر شدن شهروندان در امور اداری محلی و مشارکت در برخورد با مباحث اجتماعی خاص و درنهایت توجه جامعه به معلولین و ناتوانان و ایجاد امکان مشارکت این گروه در مسائل اجتماعی با بهره‌گیری از فناوری اطلاعات نمونه‌هایی مهم از این تحول شگرف هستند. چنین تغییراتی مسلماً با ایجاد مشاغل جدید در این حوزه همراه خواهد بود که نمونه‌هایی از آن عبارت‌اند از:

۱. 5#**PERSONAL CHARITY PLATFORM MODERATOR**$ ĈÎ¸ÉĂĉ¾Ċ· ćwĄù½Āæ£Ē~ ¾ĉºù این فرد پرونده‌های نیاز شخصی (مانند کودکان مبتلابه سرطان یا سالمندان تنها) را گردآوری کرده و میان مردم نیازمند کمک و افراد خیری که به اشکال مختلف آماده کمک هستند (کمک مالی یا همراهی در امور و غیره) پیوند ایجاد می‌کند.

۲. 5#**SOCIAL CONFLICT MEDIATOR**$ĈÝwú¤«v ¡wÊéwþù Ĉ¬ýwĊù فردی است که در حل مسالمت‌آمیز مناقشات مختلف نظیر فرهنگی، ملی، مذهبی و غیره میان گروه‌های اجتماعی میانجی‌گری می‌کند.

۳. **SOCIAL WORKER FOR DISABLED PERSONS** $ ¢ý¾¤þĉv ć½ÿwþå ā¹wæ¤Åv wz óĀöÞù ¹v¾åv ĈÝwú¤«v ½wí¹ºù 5#**ADAPTATION USING INTERNET TECHNOLOGY** متخصصی که با آموزش مهارت‌های موردنیاز افراد معلول برای اشتغال از راه دور به آن‌ها کمک می‌کند. این کمک مواردی چون انتخاب شغل و سازمان‌دهی برای زمان کار و استراحت را در برمی‌گیرد.

۴. **STATE-PRIVATE PARTNERSHIP** $ ĈÝwú¤«v ½Āùv ½¹ ĈÍĀÎ· ÿ Ĉ¤ÿ¹ ćwă È¸z ć½wîúă Ì Î¸¤ù 5#**SPECIALIST FOR THE SOCIAL SECTOR** کمک به عقد قرارداد میان کارکردهای اجتماعی دولتی و کارآفرینان اجتماعی که مایل‌اند این نوع خدمات را به‌صورت همکاری بخش‌های دولتی و خصوصی انجام دهند.

۵. 5#**CROWD SOURCING EXPERT FOR SOCIAL ISSUES**$ĈÝwú¤«v ¦³w{ù ćv¾z ĈÞú« Ĉzwĉ Ü{þù Ì Î¸¤ù مدیریت پلاتفورم منبع یابی جمعی برای جمع‌آوری اطلاعات درباره مشکلاتی که در خانواده‌ها، منازل مسکونی، مناطق شهری و حومه، جاده‌ها، پارک‌ها و سایر اماکن عمومی وجود دارد و انتقال چنین درخواست‌هایی به مقامات دولتی یا سازمان‌های غیرانتفاعی وظیفه این فرد است. پیگیری اقدامات مقامات دولتی نیز ازجمله این وظایف است. این‌گونه امور هم‌اکنون توسط نهادهای مختلف تا حدودی انجام می‌شود، اما این شغل فعالیت‌ها را متمرکز خواهد کرد. دنیای آینده به چنین شغلی بیش‌ازپیش نیاز خواهد داشت.

۶. 5#**ENVIRONMENTAL COUNSELOR**$ ĈÖĊ´ù¢Æĉ¿ ½ÿwÊù متخصص در تأمین پشتیبانی برای آن دسته از گروه‌های اجتماعی است که در جهت بهبود وضعیت محیط‌زیست فعالیت می‌کنند. او با نظم بخشیدن به تبادل اطلاعات بین این گروه‌ها و کمک به آن‌ها برای نظارت بر تولید صنعتی و پایش فعالیت‌های مقامات محلی در شهرها و روستاها این وظیفه را انجام می‌دهد. بسیاری از مردم مشتاق مشارکت در این‌گونه فعالیت‌ها هستند و متأسفانه عموماً با نبود فرد سازمان دهنده‌ای که به آن‌ها بگوید چه باید بکنند، روبرو می‌شوند.

۷. **GOVERNMENT AUTHORITY COMMUNICATION** $ ĈúÅ½ ¡wùwêù wz Ów{£½v ÷½Āæ£Ē~ ¾ĉºù 5#**PLATFORM MODERATOR** این فرد در سازمان‌دهی گفتگوها آنلاین و غیر آنلاین میان فعالان عمومی و مقامات

رسمی دولتی در حوزه‌های خاص مانند آموزش، ساخت‌وساز، بازنشستگی و غیره تخصص دارد. هدف این شغل توسعه راه‌حل‌ها به شیوه‌ای جمعی است.

۸. ù Ì Î ¸ ¤ù 5#**MIGRANT ADAPTATION SPECIALIST**$ Ĉ£¾«ẁAù ½Ãù مهاجرت یکی از رویدادهای رو به رشد در جهان امروز است که به دلایل گوناگون در آینده بیشتر نیز خواهد شد. مهاجران در زمان ورود به کشور مقصد با مشکلات فراوانی نظیر عدم آشنایی با زبان و فرهنگ جدید روبرو می‌شوند. این فرد موظف است با استفاده از پلاتفورمهای آنلاین به آموزش زبان و فرهنگ مهاجران کمک کند.